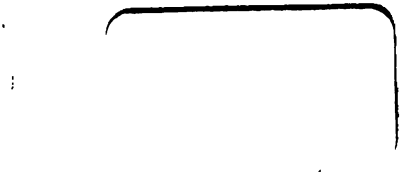
THEORIES WORTH HAVING

FRANCIS EDGAR STANLEY



THEORIES WORTH HAVING
AND OTHER PAPERS

Francis Stanley

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BY

FRANCIS EDGAR STANLEY

BOSTON
PRIVATELY PRINTED
1919

TO THE

Friends of My Husband

AUGUSTA M. STANLEY

TO THE READER

MR. STANLEY left many writings in the form of essays, club papers, and editorial notes which are thought valuable by his family, as showing the qualities of a rare mind, and the philosophy of a busy and practical man. Although not intended for publication, I have thought best to preserve a few selected from the club papers written for the Monday and Tuesday Literary Clubs of Newton, and they are herein reproduced for the pleasure and benefit of his family and friends.

The year in which each article was written is indicated, as conditions seemed to require, owing to the rapid changes in world thought.

It is hoped that the facts and theories herein expounded by Mr. Stanley may be considered worth having.

AUGUSTA M. STANLEY

Newton, June 10, 1919

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BIOGRAPHICAL SKETCH

FRANCIS EDGAR STANLEY, teacher, inventor, and manufacturer, was descended from Puritan ancestry on both his father's and mother's side — the Stanley and French families of Attleboro, Massachusetts, and the old Fairbanks family of Dedham. These families were of the old pioneer stock of New England — and highly respected for their industry, ability, and integrity. They were of a strong and sturdy stock, and Mr. Stanley's immediate ancestors migrated northward, seeking homes along the rivers, on the hills, and in the valleys of the picturesque State of Maine — then a part of Massachusetts.

Mr. Stanley was born in Kingfield, Maine, June 1, 1849, and died at Wenham, Massachusetts, July 31, 1918, as the result of an automobile accident, while driving from his summer home on the Maine coast to his home in Newton. He was the son of Solomon and Apphia French Stanley, and was one of a family of seven children. His father was a teacher and

farmer, and occupied positions of trust in his town, county, and state.

Francis Edgar Stanley was brought up in the village of Kingfield, where he and his twin brother, Freelan Oscar, were always known as the "Stanley Twins." They were industrious, resourceful, and exceptionally fine students, their talent for acquiring knowledge far exceeding the limits of the common schools of the day. They both attended and graduated from the Farmington Normal School. Mr. F. E. Stanley taught for several years before going into business, and to the last day of his life he was ever a student.

He had an artistic temperament and an unusual talent in portraiture. At one time he had decided on law as a profession, but the demand for his free-hand portraits, which he was making in increasing numbers, attracted him to this work. In search of a larger field, he removed to Lewiston, Maine, where later he added photography, and becoming very successful was soon one of the leading photographers and portrait artists of New England. In 1883, Mr. Stanley made a series of experiments in the photographic dry-plate. He developed a formula of his own, and began the manufacture

of photographic dry-plates in Lewiston, Maine, where his twin brother joined him in business. Automatic machinery was invented and installed for making these plates in large quantities, and the business developed until the Stanley Dry-Plate became known throughout this and foreign lands.

When it became evident that the growth of the business required the establishment of a plant nearer the market, where better railroad facilities were to be obtained, the Stanley Dry-Plate Company moved to Newton, Massachusetts, in the spring of 1890, and located on the banks of the Charles River, which was the seat of their business activities ever after. After many years of prosperity as manufacturers of dry-plates in Newton, they sold their patents, good-will, and all other appurtenances to the Eastman Kodak Company, of Rochester, New York.

Through his restless energy in improving common things Mr. Stanley conceived the idea of applying steam as a motive force for propelling vehicles upon the highway. He had for many years been intensely interested in the problem of self-propelled carriages, and in the spring and summer of 1897 he began a series of experiments, which in the end resulted in

the first steam motor car to be successfully operated in New England.

He utilized and adapted the common type of locomotive engine which has been the standard since the days of George Stephenson, and was the first to construct a high-pressure boiler of light initial weight, yet of sufficient water capacity to provide for the storage of a considerable amount of heat. The boiler, combined with a light-weight reversing engine, and an unfailing application of gasoline fuel under perfect combustion, made a compact little plant which was capable of developing power greatly in excess of the rated capacity.

The first car Mr. Stanley built resembled a common wagon with dashboard, wire wheels, and pneumatic tires, and was guided by a curved handle. From the first there was no question of its power or speed. A company for the manufacture of these automobiles was formed consisting of Messrs. F. E. and F. O. Stanley. This was in 1897. In a few years many cars had been built. They modified the type slowly, but kept continually adding automatic devices of their own invention, thus blazing the way for the development of the motor vehicles of to-day.

Mr. Stanley designed the first motor car to travel two miles in less than a minute. This record was made at Ormond, Florida, where the car, driven by Fred Marriott, made a record of a mile in twenty-eight and two fifths seconds.

The history of the development of the Stanley car is a part of the history of the automobile of America.

For some time previous to his death, Mr. Stanley had been studying the problem of the "unit car," or the development of the Stanley method of handling steam at high pressure as applied to the running of unit cars on interurban lines; in other words, a car to take the place of the interurban trolley-car. One of these cars had been running successfully on a New England interurban railroad, and Mr. Stanley was on his way to a conference with the engineer at the time of his death.

Mr. Stanley's inventive ability was not limited by the inventions already mentioned. With his brother he invented a process for manufacturing illuminating gas from gasoline, known as the Stanley Gas Machine — in use in many suburban districts to-day. By himself, and in connection with his brother, he took out

many patents, always along lines of practical utility.

As has already been stated, Mr. Stanley had an unusual artistic temperament, and was a lover of music, having a fine tenor voice. When a young man he was a choir-singer and leader. In later years he was a patron of music, and during his leisure hours, together with his brother, gave much attention to the theory and practical science of violin construction. Several violins that he had made and a fine violoncello are among the cherished samples of his handiwork left his family. With his love of music, and his great mechanical skill, his work along these lines was a real joy in the life of this strenuous business man.

One of the greatest of Mr. Stanley's talents was his power of concentration of mind, which enabled him to think continuously on any problem until it was solved. He was an indefatigable worker, and found his greatest enjoyment in his work. Largely self-educated, he attained a wide and exact knowledge upon a great variety of practical and useful subjects and a deep insight into the fundamental principles of philosophy and fact. All his life he was a student of mathematics and physics, espe-

cially as they concerned the development of technical problems.

He was a great reader of the best authors — Herbert Spencer, Huxley, and Charles Darwin — particularly in his earlier years, and of the best writers on philosophy and ethics of a later day. He was very fond of Dickens, Charles Reade, and Mark Twain — the latter perhaps being his favorite author. When he had been taxing his brain power to its utmost, he would pick up a detective story or some witty or humorous book and read it as a relaxation, with intense satisfaction.

He was deeply interested in social economics and was a life member of the National Economic Association. He was an able and vigorous public speaker, and a writer of unusual power and clarity on social, economic, and mechanical subjects.

Although inventive and creative, he was possessed of sound business sense. He did his own thinking on politics and all social and economic problems. He was a remarkable story-teller and an incomparable conversationalist with an unusual fund of humor. He shared with the pioneers in the stress and strain of the earlier days, but prosperity made no difference

in his simple habits, or his attitude toward his fellow men, seeking as he did always to bring into use his conceptions of justice and brotherhood.

He was proud of his New England lineage, and of his birth among the hills of Maine. He loved all outdoors, the woods, the mountains, the seashore, where he went each summer to live by the sea, or to fish in the lakes along the northern border. His personality partook of the high purpose that pervaded his whole life. Everything was ordered on the basis of the practical and the useful, whether on the material, the artistic, or the idealistic side of life. He was concerned in all movements of human betterment. He was never a perfunctory member of any organization to which he belonged.

Besides being a member of the National Economic Association, he was a member of the Economic Club of Boston, of the Monday and Tuesday Literary Clubs of Newton (for which these essays were written), of the Brae-Burn Country Club, and the Hunnewell Club, which he served as president. He was a member and a past-commodore of the Boothbay Harbor (Maine) Yacht Club.

Mr. Stanley married, January 1, 1870, Au-

gusta May Walker, daughter of William and Mary Walker, of New Portland, Maine, and a descendant of Edward Woodman, who came from England to Old Newbury, Massachusetts, in 1632. Mr. and Mrs. Stanley had three children: Blanche May, who married Edward M. Hallett, of Newton; Emily, who married Prescott Warren, of Cambridge; and Raymond Walker Stanley, who married Constance Hughes Jones, of Newton Centre, and who served his country in the Aviation branch of the Army during the late war.

Mr. Stanley was devoted to his family and his home. A kind husband and indulgent father, he was never happier than in the midst of his own family circle. His personal life was absolutely clean and pure. He thought on high lines, and lived as he thought. He had, in short, the energy and uprightness, intellectual ability, common sense, and sound judgment that distinguish the best New England blood. In addition to these qualities, he was a man with an infinite capacity for enjoyment of the righteous things of life and had a most cheerful nature, a kindling wit, and powers of mind and body of the highest order.

He had a kindly spirit and a genuine love for

his fellow men, and he left behind him a name to honor and cherish and a host of friends from every walk in life who esteem him as one of the remarkable men of his time.

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1915

ALTHOUGH this is regarded as a scientific age, an age when our activities are influenced and directed more by the principles and theories of science than ever before, yet we do not fully realize that science is useful only to the extent that it enables us to construct theories. Many of our successful men and women pride themselves on their ability and reputation as practical workers, but are very impatient of theories and theorizers. To them a theorist is a visionary, one dwelling in an ideal world, and groping about in an intellectual fog in pursuit of unsubstantial fancies. They liken the theorist to the dog of the fable, who while crossing a stream dropped his bone while clutching at a finer looking shadow. The practical one proposes to hold to the bone, and when the problem under discussion is of personal interest and the bone of contention one that involves wealth, social position, or anything about which there is a conflict of interests, then any attempt to consider the problem theoretically, or with

reference to established general principles, is spoken of as a mere academic treatment of the subject, and the conclusions thus reached are brushed aside as of no practical value. Thus there is a tendency to make it appear that such questions are questions of facts and not of theories.

A striking example of this is found in one of President Cleveland's messages, recommending a revision of our tariff schedules. He says, "It is a condition and not a theory that confronts us." But there follows immediately a criticism of the theory of protection to infant industries, and with a resort to ridicule, he says: "When such industries have celebrated their hundredth anniversary and are still asking for protection, we begin to inquire how long it takes an infant industry to reach maturity." Plainly a criticism of the theory which accounts for the condition.

The above suggests the question, "What is a theory?" A comprehensive definition would be as follows: A theory is a perception or contemplation of the relations of the parts of a systematic whole. Or we may say it is a conception of how a result has been brought about or a prediction of how something can be accom-

plished. A theory, therefore, is a knowledge of the relations of phenomena and cannot be formulated by the contemplation of a single phenomenon. Such relations may be either static or dynamic, but when recognized as causal relations, then the theory makes possible the prediction of what would result if certain things were brought into specified relations with each other.

Facts, therefore, are the raw material out of which theories are constructed and a single fact is of no practical value until its relation to other facts is discovered. But since theories enable us to predict future results they furnish the foundation for all our expectations, our hopes and fears, and our belief in the truth of our theories constitutes our faith. Upon reflection the practical one will see that all are theorizers who have intelligence enough to think out and work along any efficient plan in their practical affairs, and success in any undertaking depends upon whether the theory or plan of operation is correct.

Now, we ask, What is a correct or true theory? A true theory is one that includes all the relations of all the phenomena pertaining to a given system. A theory is absolutely true when

all the facts are known and considered. Mathematical theories would be examples. A theory is relatively true when it includes and harmonizes all the known facts of a system. The Newtonian theory of gravitation is an example. Newton's theory was announced when it was found to include all terrestrial phenomena and the phenomena pertaining to celestial bodies as far away as the moon. But that it was a law extending throughout the universe was an *a priori* conclusion, of a high degree of probability, but not absolutely known to be true.

Next we ask, When did mankind begin to theorize? Answer: When he first took cognizance of the relation of cause and effect, and could consciously adapt means to ends. It is a well-established principle in biology that the development of the individual of a species is an epitome of the evolution of the race. Assuming that to be true, we conclude that primitive man began to theorize, just as does the child of to-day, when he had reached a certain stage of intellectual development. The children of to-day at a certain period of their intellectual growth are primitive men and women, and they look out upon nature and contemplate their surroundings just as did their prehistoric an-

cestors. And what do they see, and what did primitive man see, and what were the theories they formulated, to account for the surrounding phenomena?

Primitive men knew little more of industrial methods, such as agriculture or the mechanical arts, than did the other animals among which they were struggling for existence. They had no fire, no weapons with which to defend themselves, no implements to aid in procuring food. The most important invention ever made in the world may have been when some man discovered that a stick or a stone could be used as a weapon of defense. Defenseless as they were, amidst the destructive forces of nature, cold, storms, and the wild beasts, the predominant feeling of primitive men must have been fear. Their attention was most frequently called to things that hurt them, so the most pressing desire was for safety. Safety first! Things that moved they thought of as having life and so the wind, the storm clouds and lightning they turned into malevolent beings, which they finally came to regard as gods. Then they began to offer them the things they thought they would like, with the hope of persuading them from inflicting injury. Thus the gods of the child-

hood of humanity were such as filled the souls of men with dread, and the first prayers were pleas and entreaties intended to ward off impending ills, and the first altars were built by fear. Thus the primitive religions were founded on polytheism or, in its lowest forms, on fetishism.

Ages upon ages passed and some of the races of men grew wiser. They discovered that praying to storms and clouds and suns and the lightning did no good and they came to the conclusion that they were not gods, but that they were governed by some higher, some central power. Thus polytheism finally gave place to monotheism, and the forces of nature were no longer regarded as malevolent beings, but as things that might be made helpful. There was then but one God instead of many, but he differed in character from the others only as the intelligence of men of that period differed from that of their predecessors.

Men have always reasoned, just as they do now, from what they know. As the poet says:

"Say first, of God above or man below
What can we reason but from what we know?
Of man what see we but his station here,
From which to reason, or to which refer?"

Having by his superior intelligence and by the use of weapons after ages of conflict gained dominion over the lower animals, and by the use of tools and the discovery of other improvements in industrial methods, gained some dominion over inanimate nature, what, then, were man's theories of creation and his conception of the creator?

The early Hebrew Scriptures furnish an answer. As those philosophers contemplated their environment, they saw the earth, solid, motionless, an irregular plane, extending in all directions indefinitely, and arching above it a great crystalline dome or firmament separating the waters above from the waters below. They saw the heavenly bodies, the sun, moon, and stars, pursuing their ceaseless way from east to west, their motion and apparent size contrasted with the stationary earth proclaiming their insignificance. They saw the organic forms that surrounded them, the plant life, and saw that it was good, for it furnished them with food and was otherwise useful. They saw the animals also and realized that none rivaled mankind in dignity and intelligence.

From such interpretations they naturally reasoned — that everything had been created

for their use; the sun to give *them* light by day and the moon and stars by night. And they also thought that everything had been originally created fully developed just as they saw it, and by an external agent or god, of whom they formed a conception. That conception pictured God as a sort of superman, a being that could love and hate, be angry and pleased, could attempt to accomplish a purpose and fail and repent that he had tried. A purely anthropomorphic conception of the deity, and a theory of the origin of organic species, requiring a special creative act for each organic form, making the species distinct, unchanging, and immutable.

So their theory of the universe was geocentric, for they placed the earth in the center and made it immeasurably greater than all celestial bodies; and lastly their theory was anthropocentric, for it made man the central figure and sole object of creation. These conceptions and conclusions taken as a whole formed a collection of scientific theories, theological dogmas, and religious sentiments interdependent and inseparable.

Comparative theology, history, and psychology unite in showing that, or a similar system

of cosmogony, to have been the belief of all races in all the world in the beginning of their civilization.

When to the combination above referred to, of scientific facts and theories, theological dogmas and emotional or religious faith, there is added the belief that the facts and theories have not been acquired by any natural process of observation and deduction, but by a process of revelation through sacred writings, the authors of which were supernaturally inspired, and the writings therefore infallible, then the system acquires a high degree of permanency, and its votaries become ultra-conservative.

Such was the condition of the Roman Church, when established under Constantine in the fourth century. It was called a Christian Church, but was much more pagan than Christian, and the Hebrew cosmology as found in the sacred Scriptures was adopted and regarded as infallible.

Subsequent events have shown the dangers and evils that result from such a method of establishing theories which advancing knowledge was sure to disprove. A conflict between those who claimed that all the facts relating to the origin and nature of the universe could be

found in the sacred writings and those who went to nature for their facts, and relied upon reason for their conclusions, was inevitable.

For more than a thousand years the Roman Church in a large measure dominated European thought. The condition of Europe during that period furnishes a striking illustration of the effect of the adoption and perpetuation of false theories. It was far from being an age of progress. Science in many fields was repudiated as inconsistent with the pretensions of the Papacy, but, during later years, the Church devoted considerable attention to the encouragement of art. But music, paintings, and sculpture, though they may be exquisite adornments, contain little of the living force that can supply humanity with the first essentials of life — namely, the food, clothing, and shelter upon which their lives and happiness depend. Hence, at the time of the Reformation the nations of Europe were sadly deficient in that living energy and guiding knowledge which leads to economic efficiency and prosperity.

The religion of Europe during that period being more Oriental than Occidental, the theory of self-contempt took precedence over that of self-respect. There was much of self-

abasement in their religious manifestations, but little of the idea of a life of service to humanity by the utilization of physical and intellectual energy, which is the substance of the precepts of Christ. Illiteracy everywhere prevailed, and, as it always does, gave rise to superstition. Europe was full of miracles. On all the roads pilgrims were wending their way to the shrines of saints renowned for the cures they had wrought. The attempt of the physician to practice the healing art in accordance with rational and scientific methods was not encouraged by the Church, as it interfered with the profits of the shrines.

So steeped in superstition were the people that when Halley's comet appeared in 1456 it was thought to be a harbinger of the vengeance of God, and it was necessary for the Pope himself to interfere and protect the people from so dreadful an apparition. He exorcised and expelled it from the skies, and it slunk away terror-stricken into the abyss of space, and did not dare return for seventy-five years.

That superstition continued to prevail until the seventeenth century, when Edmund Halley, an English astronomer, assuming the comet to be a planet circling around the sun, com-

puted the time of its revolution, announcing its appearance once in seventy-five years, and predicted the time when it would next appear. Thus induction and deductive reasoning banished superstition, and the comet was no longer a thing to cause terror.

I cannot find a better illustration of the contrast between medieval superstition and asceticism and the scientific utilitarianism of modern times than that found in Mark Twain's story of the Yankee in King Arthur's Court. This Yankee went to visit the hermits or religious anchorites. He says: "By and by we came to one of the supremely great ones. His stand was in the center of a large plain, and it took all the space to hold the people that came to see him. He was doing what he had been doing for twenty years, bowing his body ceaselessly and rapidly almost to his feet. It was his way of praying. I timed him with a stop-watch and he made 1244 revolutions in twenty-four minutes and forty-six seconds. It seemed a pity to have all that power going to waste, so I connected him with some elastic cords, so that as he continued his worship he ran a sewing machine. I got five years good service out of him and he made upwards of 18,000 tow linen shirts.

Those shirts when worn were regarded as a perfect protection against sin, and therefore sold like hot cakes for $1.50 apiece."

Absurdly grotesque as the story is, its author had in mind a great sociological principle which if understood will aid us in solving a most difficult and important problem.

Intellectual freedom is a necessary concomitant if not a cause of progress, and progress is most rapid where freedom is most perfect. Understanding that principle, and knowing the tyrannical and cruel methods by which Europe was controlled either by papal or civil rulers during the ten centuries preceding the Reformation, we are not surprised at the intellectual, industrial, and even moral stagnation. The controlling theories were not such as would bring about the adoption of social customs and industrial and sanitary methods that would tend to support more life or support it more abundantly. "Prove all things; hold fast that which is good" was not the spirit of those times. How can we measure the effects?

The following is one method: The increase in numbers of the individuals of a species depends upon the relation between the generative powers and the resistance to life. The human spe-

cies if unhindered would double in twenty-five years. During the thousand years referred to the population of Europe hardly doubled once, so great was the resistance to life on account of the unsanitary mode of living and the dependence upon shrine cures and other supernatural methods of treating diseases.

Then the struggle for temporal rule between the Papacy and the civil authorities, together with the fact that the Church had done practically nothing for the material well-being of the people, and the moral effect of such practices as the sale of indulgences for the perpetration of sin, led finally to an intellectual, political, and moral revolt that only required the leadership of Martin Luther to make effective. Then, voicing the sentiment of Northern Europe, that great reformer came out and openly denounced Catholicism, declaring that the Church of Rome was not a Christian Church as it had utterly failed to justify its claim to that title.

Thus Protestantism was established and a step was taken toward intellectual freedom. But it was only a step, for the same theological tyranny was manifest when John Calvin caused the cruel execution of Servetus as when Bruno

was condemned and executed in the same manner by the Catholic Inquisition. But the seed of intellectual freedom having been sown nothing could prevent its germination and the development which followed, however much it may have been retarded. Centuries upon centuries of intellectual slavery and tyranny have finally given place to freedom of thought and the expression of thought, and here in the United States at least disbelief of any theory, religious or otherwise, is no longer regarded as a crime of which the civil authorities can take cognizance.

Now we are ready for the question: What is the criterion by which we are to determine whether a theory is worth having? First, we say, a theory is worth having only to the extent that it is a true theory, and a true theory is one that harmonizes with the facts. Also there is no way of knowing what is true, except by the use of our natural powers of induction and deduction. For we note that in the conflict over the theories that account for the phenomena of nature, between those who have upheld the theory of supernatural revelation and mysticism and those who relied upon reason and went to nature for their facts, reason has tri-

umphed over mysticism, and the theories that have made for the progress of humanity are founded on scientific knowledge.

Second, a theory to be worth having, must act as a spur to energy. It must furnish the motive or incentive that prompts activity, or the expenditure of physical or intellectual energy, in attempts to supply wants.

And lastly, it must direct that energy along the line of productivity.

That is the best theory, then, that furnishes the greatest incentive to activity, and directs the activities along the line of greatest productiveness. Theories of all kinds, whether economic, governmental, or religious, must have the effect ultimately of influencing production, so that somewhere at some time human life can be supported more abundantly. The individual, society, or nation whose theories do not check up to the above standard, but instead sanction the expenditure of physical and intellectual energy in amusements that leave no residual benefits, in religious ceremonials and practices prompted by a belief in some antiquated superstition, that do not result in greater strength to resist the destructive forces to life in this world, or on national functions that do not add to the

permanent strength and economic efficiency of the nation, may, like the anchorite in Mark Twain's story, be likened to the steamboat that was trying to sail up the Mississippi River. The whistle on the boat was so large and they blew it so often that there was not steam enough left to turn the propeller fast enough to make headway against the current, and so it drifted backward. It became reactionary.

At the present time, those who would construct theories pertaining to mankind, his origin, nature, social relations, or destiny, may do so with safety, but their acceptance depends upon whether they harmonize with the accepted facts and principles of science and not upon their conformity with any of the so-called revelations of ancient times.

The adoption of the principles of evolution has greatly modified all our sociological theories. The importance of conserving and utilizing human energy is emphasized when we understand that the organic growth which we call progress is the outcome of a struggle for existence where the fittest survive, and by the fittest is meant the most efficient in the particular struggle in which they are engaged. Furthermore, the struggle, wherever or whenever it

may have occurred, is always traceable to the same cause, namely, a conflict of interests due to scarcity.

This struggle is present wherever there is organic life either vegetable or animal. Wherever the surface of the earth contains the elements needed for plant life, and the necessary sunlight and heat are present, there we find vegetable life exploiting every possible resource of nature. Each separate plant is sending its rootlets down into the soil, monopolizing to its fullest capability the nutriment and moisture found there, and at the same time sending up its branches and unfolding its leaves to receive the light and heat of the sun's rays, and in absolute disregard of the fact that other rootlets require nourishment and other leaves must have sunlight or perish. Throughout the vegetable world there is no mitigation of the principle that might makes right and nothing succeeds but success.

The same is true of animal life in its lowest form, and until the higher types are reached the same unmitigated struggle continues, and there are no rules of the game. The first modification of this principle appears among gregarious animals. There a primitive coöpera-

tion enables the pack to more easily obtain food, and better protect itself from the destructive forces of the jungle. That marks the beginning of the struggle among groups as distinguished from that among individuals. Then to the extent that the individuals of the group, acting singly, are incapable of protecting themselves from the destructive forces of the jungle, the preservation of the life of the group takes precedence over that of the individual. But, since the strength of the group is the combined strength of the individuals composing it, conflicts among members within the group must be restrained, otherwise the group would be weakened or destroyed.

The restraints placed upon the conduct of the members of a group toward each other, made imperative by the necessity of the preservation of the life of the group, marks the beginning of that sociological principle which determines the subordination of the citizen to the nation, for the principle applies the same to groups of human beings as to packs of the lower animals, the same to tribes of savages or civilized nations as to a pack of wolves.

That is, where the lives and welfare of its citizens depend upon the ability of the nation to

protect itself against the destructive forces of its environment, either by defensive or offensive warfare, there the sovereignty of the state must be supreme, and the theory must prevail that the conduct of the citizens must be so regulated as to conduce to the greatest fighting strength of the nation. Should such a condition exist, militarism would be a necessity, and when the nation is at war the theory would prevail that might makes right, and success would justify the means.

But, whatever the conditions or motives that cause war, other things being equal, that nation will triumph which has a complete and systematic organization, so that the energy of the army and those who supply the needs of the army are most effectually combined and efficiently utilized. That can only be accomplished by a system of regimentation that extends throughout the entire community, and includes not only the army, fixing the rank and location of every officer and soldier, but the industries as well, and the work and location of every artisan must be known and catalogued. Then the most perfect military coöperation is secured and the ability of the nation to defend itself by inflicting injury upon its enemies

reaches the highest efficiency. But such coöperation would be compulsory and neither the soldier nor the artisan would have any alternative but to obey. And in proportion as men are compelled to coöperate their self-prompted actions are restrained, so the government of a nation devoted to militarism is necessarily despotic.

I doubt if there has ever been since the dawn of civilization any other nation so completely organized for war as was Germany at the beginning of the present conflict. And it has had its effect on the character of the people. Making success in war the greatest glory, they are led to identify goodness with bravery, and to regard strength to inflict injury upon others the greatest accomplishment. In order to justify the enormous expenditure of time and capital devoted to militarism they assume that they are surrounded by enemies that are ready to attack whenever they show weakness. The hatred of other nations is in Germany carried to the extreme. And the intensity of that hatred is proportionate to the strength of the other nation; hence their supreme hatred for England on account of her strength at sea.

Maintaining such an attitude toward other nations deadens their sympathies and leads

them to look upon success in war as a complete justification of the means, and there are no rules of the game. Hence the tragedies of Belgium and the Lusitania.

The theory of militarism of the German type is based upon the following assumptions: First, that the citizens of the nation, the merchants, the manufacturers, the agriculturists, and all the others, cannot carry on their industries unmolested without the protection of the army and navy, since they are in constant danger of attack and destruction by foreign enemies. So the only way of preserving their individual existence is by the preservation of the life of the nation. And lastly, it is assumed that the success of the nation in maintaining its existence is dependent upon its ability to inflict injury upon other nations, and not upon international coöperation through the channels of industry, such as would bring mutual international benefits; or, in other words, it is assumed that the life of the nation is better protected, and the welfare of the people more secure, when they are universally feared and hated, than when loved and respected by all mankind. We say, other things being equal, that nation will triumph which has a complete military organiza-

tion. But can other things be permanently equal? Are such theories worth having? Do they harmonize with all the facts?

The theories of militarism are directly opposed to those of industrialism. Whenever two or more individuals, or groups of individuals, are brought into close relation in their industrial activities, there are two alternatives open to them. They can either fight or coöperate. After ages of conflict, where destruction of others was thought to be the road to success, it was discovered that mankind could make a better living and make it easier by coöperating than by fighting.

The form of coöperation by far the most beneficial and extensive is that which is made possible by an exchange of commodities or services which enables each individual or group of individuals to engage their industrial energy along the line of greatest productivity. This greatest industrial efficiency can result only from a division of labor and specialization of industrial function, made possible by exchange of commodities or services. The greatest difference between the modern civilized nation and the barbarous tribe is the greater diversity of employment, the greater specialization of in-

dustrial function. And one of the unavoidable results of such a specialization is a greater dependence upon others for the supplies necessary for sustentation.

The savage, like the lower animals, supplies his own wants directly by his own labor. The civilized man produces a commodity or performs a service that supplies the wants of others, and with the proceeds which come from exchange he supplies his own wants.

These theories apply to nations as well as to individuals, for when analyzed we find that in times of peace the industrial relations of nations are nothing but the relations of individuals coöperating across a geographic line. And, other things being equal, those nations will be industrially most successful where there is the least resistance to international coöperation, or where exchange of commodities and services is least restricted, so that the labor and capital of the nations can be employed most productively. The laws of industry are not circumscribed by geographic limits any more than those of morality. Now we wish to emphasize the fact that with nations, as with individuals, the more they coöperate and specialize in their industrial activities the greater will be the vol-

ume of international commerce, and the more dependent upon each other will the nations become for the supplies necessary for sustentation. Furthermore, the effect of international coöperation upon the character of the nations is the same as that upon the character of individuals coöperating within the group.

This brings us to the final topic, namely: What is the effect of a devotion to industrialism upon the character of a people, and what are the type and functions of the government best calculated to promote industrial coöperation? In answering these questions we again call attention to the facts upon which our theories are founded.

First, we say the adoption of industrialism does not end the conflict of interests due to scarcity. Neither does it at once eliminate the predatory characteristics of human nature. We must keep in mind the fact that all our physical, intellectual, and moral characteristics, whether good or bad according to our present standards, are such as at some time fitted the species for its environment, and were acquired in accordance with the grim law of necessity. Those species have survived that were best fitted for the particular struggles in which they were engaged.

In our long journey up through the jungle, up through savagery and militancy, our baggage has been checked through, and it is labeled "heredity." We have brought with us in a modified form the predatory instincts that we acquired in the jungle, and they tend to unfit us for the industrial society in which we are now placed.

We started on our journey, wild animals, but we are gradually becoming domesticated. As soon as we discovered that it was better to cooperate than to fight, we began to learn how to coöperate. We have made some progress. We have learned that honesty is the best policy. In the struggle for supremacy between two competing merchants, other things being equal, the honest man will win because he has the confidence of the public and secures their patronage. So the survival of the fittest is the survival of the most honest. Every ethical principle in our code of morals has been forced upon our attention by the law of necessity. Our predatory instincts say to us, Cheat, steal, plunder. But experience says, If you do, you will go to the poorhouse or the jail. So those individuals and nations finally achieve the greatest industrial success where life, liberty, and property are

most secure, and where the normal connection between efforts and results of efforts is most perfectly maintained. That is one element of justice, the one that furnishes the greatest incentive to activity.

All human experience points to the fact that as a general rule men work most energetically when they are certain that they will be privileged to reap where they sow, or where their income is neither more nor less than the value of their production. The other element of justice is that which recognizes the principle that in carrying on our activities in the presence of others, conflicting interests must be so adjusted that all may enjoy equal freedom. The enforcement of justice is the most important function of the government which is best calculated to promote industrialism. Such a government would be administrative rather than dictatorial, democratic rather than despotic, and the elected or appointed officials would be servants and not rulers of the people. In proportion as the citizens of a nation are committed to the theory that all conflicts of interests due to scarcity should be regulated in accordance with the principles of justice, economic competition will be substituted for pri-

vate war, and the work-bench philosophy will displace the pig-trough philosophy. And in proportion as the nations of the earth adopt the theory that international coöperation is more profitable than war, and in adopting that theory abolish the restrictions upon international commerce which are the foundation of industrial coöperation, will the liability of war and the cost of preparation for war diminish.

So to-day the great problem before the nations of the world is this: Shall we coöperate or fight? Shall the struggle between nations be war or industrial competition carried on in accordance with the principles of justice? Shall the nation win that has the greatest power to destroy, or shall it be the one that can produce the most, the best, and the cheapest? I believe the only theory worth having is the theory that between nations, as between individuals, conflicting interests should be adjusted in accordance with the principles of justice, which are the principles of industrialism and the principles of Christianity.

"BLESSED ARE THE MEEK: FOR THEY SHALL INHERIT THE EARTH"

1918

NEARLY two thousand years have passed since those words were spoken, and though the being who uttered them has been, by the Christian world, regarded as divine and his sayings therefore infallible, few individuals, and, as we read history, none of the nations, have acquired their earthly possession by such a method.

To have access to the surface of the earth so as to obtain the things necessary for sustenance is a fundamental necessity of life on this planet. And to keep on living is the chief purpose of all living beings. This is as true of the human species as of other forms of organic life, and as true of the nation as of individuals. In fact no body of people can rightly be called a nation unless they occupy a definite portion of the earth's surface within which area they hold complete sovereignty. So the desire to possess the earth or a part of it is fundamental

or instinctive, alike with the individual and the nation.

Although the length of life of the individual of a species is limited, the species as a whole and the nation continue to live as long as they have access to or hold sovereignty over a sufficient geographic area to enable them to supply their physical wants. How is that accomplished? What is the law in accordance with which the life of the species or the nation is perpetuated? Is meekness the most distinguishing characteristic of the species that holds dominion over the greatest portion of the earth's surface?

The theory that accounts for the survival of the species that is most generally accepted is known as the "evolution theory." It came as an attempt on the part of its originators to account for the *origin* of the organic species by a theory more in harmony with the phenomena of nature than the old special creation idea.

Its acceptance has been revolutionary in its effect on our theories of creation, and some of the most far-reaching generalizations of modern times have come from its consideration.

Charles Darwin, of England, although not

its originator, was the first to place before the world a detailed explanation of what was meant by evolution, and to furnish sufficient evidence to place the theory upon a scientific basis, when in 1859 he published his great work entitled "The Origin of Species."

I cannot give a more comprehensive explanation of what the evolution theory teaches than by quoting the last paragraph of that great work:

"It is interesting to contemplate a tangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent upon each other in so complex a manner, have all been produced by laws acting around us. These laws taken in the largest sense being growth with reproduction, inheritance which is almost implied by reproduction, variability from the direct and indirect action of the conditions of life, and from use and disuse. A ratio of increase so high as to lead to a struggle for life and as a consequence to natural selection, entailing divergence of character and the extinc-

tion of less improved forms. Thus from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers having been originally breathed by the creator into a few forms, or into one, and, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning, endless forms most beautiful and most wonderful have been and are being evolved."

It is not often that the propounder of a new and startling scientific theory has lived to see his daring innovations accepted by the scientific world.

Copernicus did not dare publish his work setting forth the heliocentric theory of planetary motion until he was on his death-bed; and Sir Isaac Newton had been in his grave thirty-two years before his law of gravitation was generally accepted, and seventy-two years had elapsed since the publication of the "Principia," which contained a full explanation of Newton's great discovery. The theories advanced by Copernicus, by Newton, and by

Charles Darwin, each were open to the same objection; namely, they were apparently opposed to the teaching of the Holy Scriptures, for they substituted physical forces for the direct action of the Deity.

But Darwin had the good fortune to live in an age when the world had become so accustomed to additions to our knowledge of causation that theological prejudice quickly gave way before the scientific spirit of the age, and evolution was given its place as a true biologic principle.

The part of the evolution theory which concerns us in the development of our thesis, and which is most important in its relation to our social problems, is the principle of "natural selection" by the survival of the fittest in the struggle for existence. The cause of the struggle is the scarcity of the things necessary for sustentation, caused by the high ratio of reproduction. The increasing numbers of plants and animals, due to the geometric ratio of increase, is constantly encroaching upon the bounds of subsistence. Hence the struggle for life and the survival of the fittest; that is, the survival of the most efficient in each particular struggle and the extinction of the unsuccessful. "Nat-

ural selection" then depends upon a rigorous and ruthless struggle for existence.

The evolutionist will tell us that the human species has been and is subject to these biologic laws just as are all animals and plants, and that man has risen from his primitive stage of pre-glacial time, several hundred thousand years ago, when he was an animal among animals, always under the influence of the factors of evolution, and to a large extent by virtue of them.

But does mankind owe all his progress toward a higher civilization to this unmitigated struggle for existence, to the blind and brutal war of nature where the victor succeeds by annihilating the rival and where brute force is the principal if not the only means of success? Or, we ask, has that exclusive self-interest we call "egoism" been the only controlling factor in determining the continuity of the life of a species or of the nation?

Whoever answers in the affirmative denies truths that are self-evident; for, not only with the individuals of human society, whose lives are completely dependent upon the mutual aid or coöperative principle, but with the lower forms of organic life, the expenditure of phys-

ical energy in a self-sacrificing manner is absolutely essential to the preservation of the life of a species.

If we classify that action devoted specifically to self-interest, and upon which the life of the individual depends, as egoism, and if we define altruism as being all action which, in the normal course of things, benefits others instead of benefiting self, the following conclusions are forced upon us: First, since a being must live before it can act, those acts upon which the life of the individual depends precede in importance all others, for if those acts are neglected and the individual dies, all other acts are impossible. Therefore, speaking generally, egoism must take precedence over altruism.

But, secondly, if all action should end where self-interest ends, if conscious and unconscious altruism should disappear, if all vegetable forms should cease to devote a part of their energy to the production of germs for future life, and if all animals from the lowest to the highest should cease to sacrifice a part of their physical substance and their vital energy in the process of reproduction, then all life would terminate and this planet would become as barren as the crater of an active volcano.

There is therefore no escape from the conclusion that in the process of evolution self-sacrifice has been no less important than self-preservation, and the principle of altruism has developed conjointly with that of egoism.

The principle, in its application, has presented many phases, from the strictly physical and unconscious to the semi-conscious, and finally to the fully conscious altruism as formulated in the ethical maxims of the most highly civilized people. The "golden rule," "honesty is the best policy," "it is more blessed to give than to receive," are familiar examples.

The biologists tell us that the reliance for success in the world upon the mutual-aid principle, as contrasted with the mutual-fight principle, is much more widely spread among the lower animals than is usually recognized; and without question the adoption by the human species of the mutual-aid principle has been much the greatest single factor in man's achievement of his biological position, as king of living creatures.

So, it is not the exclusively self-regarding, the cruel, predaceous, exterminating species that has achieved the greatest success, but, instead, it is the species that has learned that

it is better to coöperate than to fight, better to serve self indirectly by serving others, and better to be kind, forgiving, and meek even than to be cruel, revengeful, and arrogant.

"Blessed are the meek: for they shall inherit the earth."

With this analysis we might assert that we had established our thesis and our paper might end here, but we have not yet indicated what are the far-reaching generalizations that come from a study of the law of life, as shown by the Darwinian theories, and the influence which their adoption has had upon our ideas of the origin and nature of man, and, what is most important, the influence which the theory has had upon our ideas of the nature and functions of the state and the relation that the states should have with each other.

According to the evolution theory we have moved the antiquity of the human species back from five thousand to nearer five million years, and conclude that civilized man has reached his present condition by a series of progressive steps, individually slight, but infinite in number. First, we note that all his physical and intellectual characteristics are such as tended to fit the species to its environment at the time

they were acquired, and were developed in accordance with the law of the survival of the fittest. Second, in accordance with the law of inheritance, highly developed characteristics are transmitted to subsequent generations in a more or less modified form even after the environment which produced them has changed. When we contrast the life in the jungle of prehistoric man with that of civilized man in the environment which civilization furnishes, we are not surprised at the want of harmony between the moral constitution and his present environment and the constant need of readjustment. Hence the necessity of that regulating system we call the government. The state, then, is a product of evolution. It had its origin in the dim ages of the past, when the gregarious instinct became an important factor in the struggle for life. With human society there have been the evolutionary stages of, first, the family, next, the group of families or the tribe, and last, the nation or the state.

If the survival of the species had never depended upon the coöperation of the parents in caring for their offspring, there never would have been the family.

If a family had never discovered that the

presence of another family was not necessarily harmful, or that coöperation with other families on the mutual-aid principle was better than fighting, there never would have been a tribe.

And, again, if there had never been tribes that discovered, during their brief intervals of peace, that the mutual benefits resulting from coöperation extended beyond the limits of the tribe, and that the union of several small tribes enabled them to win when fighting a common enemy, there never would have been the institution we call the state.

And, lastly, were it not true that industrial coöperation was unlimited in the area over which it could be beneficially extended, there never could have been the great nations of modern times.

But the state differs from the tribe not simply in its size, but more in the greater complexity and multiplicity of parts and definiteness of functions. In other words, a state is a highly organized social group; hence may be called an organism. But is that highly complex aggregate which we call a state an organism? Does it, made up as it is of living units, have all the attributes of the individual living organism? Let us see. A living organism, such as

one of the higher animals, is an aggregate of permanently localized parts, which have definite structures and functions, that are mutually dependent, and coöperate so as to maintain the life of the individual.

Such an organism begins life, grows up, works, reproduces, and dies, with the parts always in their respective places and moulded to their proper functions with each successive generation.

The social organism is similar in many respects. The fact that its component parts are individual organisms does not prevent the subdivisions of functions, and the mutual dependence of parts. Within the state we find the productive industries that supply the materials necessary for sustentation. That corresponds to the process of alimentation with the animal and may be classed as the sustaining system.

Then the transportation system of the nation may be likened to the circulation of the blood in the animal. So the distributing system is common to each. And then we have the regulating systems, which with the state are the laws, customs, and police regulations that serve to maintain the normal conduct of the individuals in their relations to each other and

to insure the proper performance of their functions. That may be said to correspond to the nervous system of the animal, which so directs the action of the parts as to insure the performance of the functions upon which the life of the animal depends.

Then we might cite another analogy. High animals are distinguished from low by a greater complexity and interdependence of parts and specialization of functions. Of the lowest forms, some one has said that they walk with their stomachs and digest their food with their feet.

So it is with the social organism. The more highly developed the society or state becomes, the greater the diversity of industrial and other functions, and the more dependent upon each other the individuals become for the means of supporting life.

But if we continue the comparison, we finally discover a contrast between the animal and the social organism of great significance, a contrast fundamentally affecting our ideas of the ends to be achieved by social life. As stated above, the fact that the social organism is composed of a multitude of individual organisms does not prevent the subdivision of functions,

and mutual dependence of parts, but it does prevent that complete differentiation by which one part becomes an organ of feeling and thought while another part becomes insensitive. Though the highly developed nervous system of the animal so directs the actions of the whole body as to preserve its integrity, yet the welfare of the nervous system is the ultimate object of all these actions. It is that alone which thinks, feels, suffers, and enjoys. The differentiation in the social organism cannot be carried to that extreme. Consciousness is not concentrated in a small part of the social aggregate, but is diffused throughout the mass. All the individuals that constitute the state possess the capacity for happiness and misery, if not in equal degrees, in degrees approximately equal.

Therefore, since there is no social center of thought and feeling, it follows that the welfare of the aggregate, considered apart from the welfare of its component units, is not an end to be sought, and however great may be the efforts made to promote the welfare of the body politic, it must always be remembered that the claims of the state are nothing in themselves, and become something only to the extent that they embody the claims of the in-

dividual citizens. The state, then, exists for the benefit of the citizens, and not the citizens for the benefit of the state.

If, however, the principles and conclusions as above stated are denied, if we are to consider the state a complete organism, having interests and purposes apart from and above those of its citizens, we then have to recognize the fact that the progressive evolution of the state has accorded, and must continue to accord, with the evolution of the animal species, and the ultimate success of the nation depends upon the adoption of the principle of altruism as an international policy, and the modifying influence which the mutual-aid principle must have on national egoism.

The most important question ever presented to humanity is now before the world; namely, Should the moral principles, in accordance with which the conduct of the citizens of a nation are regulated, determine the conduct of the nations toward each other? No nation can answer in the affirmative with a clear conscience, but Germany can answer in the negative, with absolute honesty, and she can produce abundant evidence to prove that she regards it as her right and duty to regulate her conduct toward

other nations wholly with reference to her own interests.

Ever since the Franco-Prussian War the theory expressed by the German writers on political and military subjects has been leaning more and more toward militarism, more and more toward the idea that the primordial struggle for existence still continues, and that there is no method of adjusting the conflicting interests of states but by war.

The welfare of the state, with such writers, is the end to which all action should be directed. To quote from General Bernhardi, "No patriotic German will look upon the state as an institution designed to promote his individual interests, but instead he should consider it his highest duty to sacrifice not only his interests, but his life if need be, for the welfare of the state." Bernhardi, in his book, "Germany and the Next War," gives very candid expression to the opinion that Germany must, regardless of the rights and interests of other peoples, fight her way to predominance. He describes the peace movement as poisonous, and proclaims the doctrine that the mission and duties of the German nation cannot be fulfilled save by the sword. All attempts to abolish war are immoral

and unworthy of humanity, and the German people must learn to see that the maintenance of peace cannot be, and must never be, the goal of state policy.

We were familiar with all these writings before the war. The campaign of frightfulness as practiced by the Germans during this war was recommended and fully justified in the writings of Nietzsche, who died fourteen years before the beginning of the war. To illustrate we quote the following: "We believe man's will to life had to be intensified into unconditional will to power, and we hold that hardness, violence, secrecy, arts of temptation and deviltry of all kinds, that all things evil, terrible, serpent-like and wild-beast-like contribute to the success and elevation of the species, to the elevation of the state."

The German writers of influence not only deny that the state should be influenced by any principle of morality which in any way recognizes the rights of other states, but that immediate self-interest alone in each particular transaction should be the only thing considered, and when at war anything that will contribute to success is justifiable. Without question both in their philosophy and their conduct during

this war they have shown a cold-blooded and calculating cruelty and a disregard for all humanitarian principles without parallel in history.

But Germany by no means monopolizes the spirit of militarism. We have here in America such writers as Homer Lea, Admiral Mahan, Colonel Roosevelt, and many others, who advocate military preparation not simply as a necessary means of defense, but they look upon war as a great moralizing agent, and a thing inevitable and necessary on account of the nature of mankind and the conflicting interests of states. And such writers, as well as the German advocates of frightfulness, base their philosophy upon the evolution theory, or a part of it, as they apparently have slight conception of the part that altruism has played in the uplifting of the human species, or the success of the lower animals in their struggle for life.

A few quotations will serve to illustrate. Homer Lea, in "The Valor of Ignorance," writes as follows: "National entities, in their birth, activities, and death, are controlled by the same laws that govern all life, plant, animal, or national, the law of struggle, the law of the survival of the fittest. The idea of international

arbitration as a substitute for natural laws, arises not only from a denial of the fiats of those laws and an ignorance of their application, but from a total misconception of war, its meaning and application."

From Colonel Roosevelt's "Strenuous Life," we make this quotation: "We must play a great part in the world and especially perform those deeds of blood and valor which above everything else bring national renown. By war alone can we acquire those virile qualities necessary to win in the stern strife of actual life." At another time he says: "We despise a nation as we despise a man who submits to insult. What is true of a man ought to be true of a nation."

The indefiniteness of such a philosophy is somewhat perplexing. We are left completely in the dark as to what a man should do who will not submit to insult. Are we to understand the Colonel, that, if one were to question his veracity, it would be his duty to challenge the man to mortal combat who had thus insulted him? And in the battle which ensued, if he killed the man, would that be proof that the Colonel always told the truth? Or, if the result of the battle was otherwise, and the Colonel was

killed, would that prove him to have been a liar?

And what does the Colonel mean when he says, "What is true of a man ought to be true of a nation?"

Knowing, as we do, that he has been one of the foremost in preaching what he calls the "square deal," which we interpret as meaning that a man should have due regard for the rights and interests of others in all his business activities, are we to infer that the conduct of nations in their dealings with each other should be so regulated as to conform to those same moral principles? If so, he will find many who agree with him.

The absence of a definite and consistent philosophy is a characteristic of the writings of most of those who write on military subjects. The German literature is an exception. Their philosophy is definite and consistent, but terrible. But those who swerve from the position that "might makes right" are obliged to abandon their line of argument and shift to different ground as their theories become untenable on account of the economic relations of nations.

To illustrate, in 1908 Admiral Mahan wrote as follows: "It is as true now as when

Washington penned the words, and will always be true, that it is vain to expect nations to act consistently from any motive other than that of interest. The old predatory instinct, that he should take who has the power, still survives, and moral force is not sufficient to determine issues. Commercial and industrial predominance forces a nation to seek markets, and, where possible, to control them to its own advantage, by preponderating force, the ultimate expression of which is possession, an inevitable link in a chain of logical sequences, industry-markets, control, and navy bases."

How does that harmonize with the following quotation from an article in the "North American Review" by the same author less than four years later? The Admiral writes: "The purpose of armaments in the minds of those maintaining them is not primarily an economical advantage in the sense of depriving a state of its own, or fear of such consequences to itself. Nations are under no illusion as to the unprofitableness of war, and to regard the world as governed by self-interest only is to live in a non-existent world, a world possessed by an ideal much less worthy than those which mankind persistently entertains."

The two statements are not only incompatible but neither expresses a correct principle. In the first quotation we are told that nations always act from self-interest, and that their actions are prompted by their predatory instincts, and that economic expediency forces a nation to obtain possession of markets by force, that is, by military force.

That is practically denied in the second quotation, and the denial is said to accord with the universal national understanding. But here the Admiral introduces another indefinite and confusing factor. He assumes that national self-interest is not what men fight for, but that the world is moved by ideals and moral incentives more worthy of humanity than mere economic self-interest. Are there any moral ideals, any problems of right or justice that are above and distinct from economic interest, as applied either to individuals or nations? At the present time, when speaking of better economic conditions or interests what do we mean? We mean better conditions for the great mass of people, conditions that enable them to live the fullest possible lives; by the attenuation of poverty and the broadening of all their material circumstances. It means that the millions shall be

better fed, better housed, and better clothed, and with an economic margin that enables them to make provision for sickness and old age, so that their lives may be cheered and prolonged, and with leisure for recreation and amusements and the cultivation of the social graces and strengthening of the family affections.

All these things and more are included in, or result from, what we term "economic self-interest." The ability of humanity to accomplish such results is the principal characteristic that distinguishes the human species from the brute creation, that elevates the civilized nation above the savage tribe, and in fact is the foundation for all that goes with what we call civilization. And furthermore, if, with the ability of civilized man to supply his physical wants, and thus make possible the supporting of the greatest quantity of human life or of life in its greatest fullness, we include those intellectual and social characteristics, and altruistic sentiments and observance of the moral principles upon which such economic results absolutely depend, we have included about all that can be expressed by the term "civilization."

Can progress toward such a civilization re-

sult from a continuation of that brutal struggle for life among individuals, the cruelty and selfishness of which are uninfluenced by the principles of altruism, or can it result from those activities of the nation, that are prompted by the predatory instincts that Admiral Mahan tells us still survive and which inevitably lead to war such as now is devastating and depopulating Europe?

We know that it cannot, because we can see that every progressive step that man has taken in his upward march toward a higher civilization has resulted from the substitution of economic production for destructive predation. The human species is the only species that has consciously and intelligently set about to increase production, and thereby to mitigate the evils resulting from scarcity. There are really but two methods of eliminating scarcity. Either there must be more produced in order that the wants of the many may be more abundantly supplied, or else the number of individuals among whom the given quantity is distributed must be made less. The former method we call economic production, or industrialism, and it is under that system that the great and good things have been accomplished which

make civilization possible. It is that system that has given us the printing press, the steam engine, the railroad, the steamboat, the telephone, the phonograph, and all the other inventions that so greatly increase production, and enable us to supply our wants more bountifully and with greater certainty.

But this system is only practicable or possible where the egoism of the individual or the patriotism of the nation is duly influenced by altruism or, as some choose to call it, by the mutual-aid principle. Of the second method we say there is no place in the world to-day for the exercise of our predatory instincts. Killing a part of the people in order that the wants of the survivors may be more bountifully supplied has never been and never can be a popular method of eliminating scarcity.

There is sure to be much time and energy wasted in argument over the question of "who are to be the survivors." A very sanguinary argument of that kind is now taking place in Europe.

It is impossible to conceive of a system of sustentation based on predation that could be universally applied. It may be possible for one thief to get a living by stealing from a thou-

sand workers, but a thousand thieves could not possibly live by stealing from one worker.

So that whatever may have been true in the remote past, our predatory instincts do not at the present time perform a useful function, but are like the appendix in the alimentary canal, which is present now only to make trouble or to furnish employment for the surgeon.

The most important function of the state, then, is to protect production against predation, to protect civilization against savagery. When a government has established and maintained the conditions most favorable to industrial coöperation, so that the productive efforts of the citizens have reached the highest efficiency, it has done about all that a government can do to benefit the people. "Give us this day our daily bread, and deliver us from evil," and we can do the rest.

The one thing that more than anything else characterizes modern civilization is the greater differentiation and specialization of industrial function, the inevitable result of which is, as already stated, the greater dependence of the people upon each other for the means of supporting life. With the exception of the predaceously inclined, all in modern society sup-

ply their own wants by supplying the wants of others. We serve ourselves best when we serve others most. Henry Ford has been the most successful automobile manufacturer because he has made a practical and efficient machine that he could sell at a price within the reach of the millions. While other manufacturers were building luxurious and expensive cars that could find a market only among the wealthy, Ford was humble enough or meek enough to face the ridicule of the public, and his success has been phenomenal. "He that would be chief among you, let him be your servant."

It is important to consider the relation of the government to the people from two standpoints.

First, it is evident that the more complex the industrial system becomes, and the more intimate and extensive becomes social contact, the greater the chances of a conflict of interests, and consequently the greater the need of governmental control and regulation in order that justice may be maintained. Hence the growing importance of that regulating system we call the government.

The recognition of the necessity of such a social organization and the willingness on the

part of the people to play the game according to the rules, we may call the spirit of nationalism. It is not the spirit of extreme egoism, the spirit of pride and arrogance, nor that of independence, that characterizes the desirable citizen, but rather such a spirit of humility and altruism as will make a man satisfied to accept, as that which is justly due him, the economic equivalent of what he contributes to the support of society. That government is best which brings the highest degree of social harmony and economic prosperity to the masses with the least restraint upon individual freedom.

Secondly, on account of the modern improvements in transportation and communication, industrial coöperation is extending over greater areas, and inevitably tends to obliterate geographic lines and to bring the people of the nations into closer social contact.

When we have enumerated the laws of economic expediency, the principles of morality, and all the ideals upon which the prosperity and happiness of the citizens of a nation depend, and in accordance with which their conduct toward each other should be regulated, we have enumerated all the laws, principles, and ideals which have any influence in securing the

greatest benefits that can result from international association and coöperation. No nation can achieve the greatest prosperity without the observance of these principles.

The more extensive the coöperation, the greater the mutual benefits, and as a necessary result the greater the dependence of the nations upon each other for the means of supporting life. Other things equal, the nation that is most dependent upon other nations, because coöperating over the greatest area and with the least interference with such coöperation, is sure to achieve the greatest economic success.

Therefore, all laws, customs, and conditions that prevent or retard international coöperation trig the wheels of progress and prevent the nations from achieving their greatest economic success.

At no other period of history has there been such extensive industrial coöperation over such an immense area and among so large a population as is now taking place here in the United States. We have a population of more than one hundred million distributed over an area of 3,027,000 square miles. This immense area is partitioned off into forty-eight states each one of which is permitted and required under the

constitution of the United States to maintain a republican form of government.

They are as distinct from and independent of each other, so far as their domestic affairs are concerned, as though they were separate nations, in all respects but one: The laws and constitutions of the states must harmonize with the constitution and laws of the United States. The constitution of the United States prohibits, without the consent of Congress, the laying of duties on imports coming either from other states or from other nations. The principle of unrestricted industrial competition is still further promoted by the interstate commerce laws which make it a crime to form a combination or agreement in restraint of trade or for the purpose of controlling prices.

Thus we have in the United States an illustration of the wonderful industrial coöperation that will develop where there are no restrictions upon commerce. That is one of the most important factors that accounts for our phenomenal industrial development.

And how has it been accomplished? What have the states given in exchange for this unparalleled opportunity? There is but one answer. The states have had to humble themselves and

become meek enough to surrender their independence and to recognize the principle that dependence upon others and serving others in accordance with the mutual-aid principle is the road to success. The states have had to surrender their sovereignty, — state sovereignty has had to bow before the sovereignty of the nation. There was no other road to progress.

The nations can achieve their greatest success in no other way. The nations that are willing to surrender their individual sovereignty and acknowledge the sovereignty of a group, and shape their laws so that they will harmonize with a federal constitution, a constitution founded upon the principles of justice, and one that will give the perfect industrial freedom among the nations that we have among the United States of America, that will be the group that will have access to the greatest portion of the earth's surface.

Therefore, when Christ uttered the beatitude which is the title of this paper, it is as certain that he was announcing a correct and eternal principle as when Sir Isaac Newton announced the law of gravitation.

"And seeing the multitudes, he went up into

a mountain: and when he was set, his disciples came unto him: and he opened his mouth, and taught them, saying, 'Blessed are the meek: for they shall inherit the earth.'"

STEPHENSON AND TRANSPORTATION

1916

THE industry which we call transportation is of very ancient origin. It is older, even, than civilization, for the savage, before the dawn of civilization, in supplying his physical wants had to move things, and that is all our modern system of transportation accomplishes.

But great changes have come about in both the manner and magnitude of transportation, and those changes mark the progress of civilization. The trail of the savage gave way to the beaten path and that in turn to the route of the caravan, and as man emerged into history he became a road builder.

The late James J. Hill once said that when a complete history of transportation is written it will be equivalent to a history of civilization. If we compare the primitive ways of living of the aborigines of this country with the industrial and economic life of modern America, there is no contrast more striking than that presented by the small per capita transportation of the

former and the enormously large transportation of the latter.

It is, I believe, a reasonable estimate that the daily per capita transportation of the American Indians did not exceed twenty pounds carried one mile, while during the year 1915 the railroad transportation alone in the United States amounted to more than three hundred billion ton miles. Dividing three hundred billion by one hundred million, the population of the United States, and that quotient by the number of working days in the year, we find that there was transported each day for each inhabitant of the United States in 1915 an average of ten tons or twenty thousand pounds, carried one mile, by the railroads alone. That gives a ratio as compared with the savage of 1000 to 1.

These changes have all appeared in quite recent times. When George Washington was President of the United States the land transportation here or elsewhere did not differ materially either in manner or magnitude from that of ancient Egypt four thousand years before. About the time of the Declaration of Independence a new era in social production appeared, as a result of three inventions, the invention of the spinning jenny, the power

loom, and the steam engine. These inventions ushered in the machinery epoch, and mechanical energy was substituted for muscular energy and power-driven machines displaced hand labor.

The steam engine of the high pressure condensing type, substantially the modern steam engine, was invented by James Watt in 1774. For nearly forty years it was used exclusively as a stationary engine. Then came the application of the steam engine to locomotion and its use as a motive power for a new system of land transportation which has produced an effect upon that industry and upon the civilization of the world, greater than that of any other single invention.

A biographical sketch of the man who was most responsible for the perfection of the locomotive and the introduction of the railroad system of transportation is the subject of this paper.

Near the close of the eighteenth century on the bank of the River Tyne, in the North of England, was situated the village of Wylam. Coal mining and iron smelting formed the principal industries, and the collieries and iron furnaces formed the nucleus of the village. About them, huddled close on narrow streets, were

dwelling-houses, owned by the proprietors of the mines, but occupied by the families of the miners.

Near the eastern extremity of the village stood a house not unlike many others. It was two-storied, with red-tile roof, rubble walls, unplastered on the inside, and with floors of clay. It was partitioned off into four rooms, two above and two below. In each one of those rooms dwelt the family of a miner.

The lower room in the west end of the house was the birthplace of one of the most remarkable men of modern times. That room was the home of the Stephenson family, and there, in 1781, George Stephenson, the subject of our sketch, was born, the second of a family of six children. Robert Stephenson, the father, or "Old Bob" as the neighbors called him, was employed as fireman of the pumping engine at one of the collieries, and when he had a wife and six children to support, his wages were only twelve shillings a week. That was barely sufficient, with the most rigid economy, to pay the rent and provide the family with food, with little left for clothing, and nothing for education. So none of the Stephenson children was sent to school.

George is described as a strong, healthy boy, full of life and courage, and with lots of mother wit. Being ambitious, and prompted by the spur of necessity, he put forth his best effort to please his employers, and when but fourteen years old he was appointed assistant fireman to his father. Great was his joy when this, his first ambition, was realized. It was said of him that there was not a lazy bone in his body, and his employers soon learned that he was a lad that could be depended upon. Therefore his advancement was rapid. When seventeen, he was promoted to fireman, and his wages were raised to twelve shillings a week, the same as his father's. This was an event of great importance to George, and when he came from the foreman's office the Saturday night when he received the advance, he announced the fact to his fellow workmen, adding triumphantly, "I am now a made man for life."

But his service in that capacity was of short duration, for before he was eighteen, he and his father found employment at another mine (the one where they were employed having become exhausted), the father as fireman and George as assistant engine-man, a higher position at advanced pay. There he had an opportunity to

study the construction and working of the engine and pumping machinery, and he applied himself so successfully, and acquired such a thorough knowledge of the machinery, that he rarely had to ask assistance from the chief engineer of the colliery. His engine became his pet, and instead of loafing away his time at the ale-house or in other customary ways, he would spend his leisure taking his engine apart, cleaning it, and studying its construction and in that way he soon became one of the most expert and capable engineers of that mining section. He never tired of watching his engine, and to him it was almost sublime in its untiring industry and quiet power, capable of performing the most gigantic work, yet so completely under control that the mere touch of the hand on the lever would regulate its speed. The daily contemplation of the steam engine and the study of its construction was an education in itself to a thoughtful young man like Stephenson. And it is worthy of note that nearly all that has been done for the improvement of the steam engine has been accomplished, not by men educated in colleges or technical schools, but by laborers, mechanics, and engine-men. There seem to be instances where the mechani-

cal instinct takes precedence over the higher powers of the mind, in efficiency in harnessing the forces of nature and causing them to do our work.

George was now in his eighteenth year, and like many of his fellow workmen he had not learned to read. While listening to others, as they read from newspapers or books, he came to realize that there was a vast storehouse of knowledge which was inaccessible to him, and if he wished to advance further as an engineer he must learn to read. To that task he applied himself, with the diligence and determination for which he was noted. He began by attending night schools where the tuition was but threepence a week. He was not ashamed to be learning his A B C's with the little children. From the time he commenced to learn to read he devoted all the time he could spare from his work to study and self-improvement, with the result that he was soon able to read and write, and had mastered the fundamentals in arithmetic, a branch in which he afterwards became very proficient.

George had now acquired the character and reputation of an expert workman, and after continuing work at the Black Callerton Mine

for three years, he was offered a position as head engineer in another mine at quite an advance in wages. This offer he decided to accept, and at the same time to marry Frances Henderson, a daughter in the family where he had boarded, while working at the Black Callerton. Although but twenty-one, he had managed by diligence and thrift to save enough to fit up a small cottage, which he rented, and as soon as it was ready the marriage took place. And there may be seen in the register at Newburn Church the names of George Stephenson and Frances Henderson, and the date November 28, 1802. The names appear to have been written by persons just learning to write.

Never were a couple better suited to each other. Their little home was a model of comfort and cleanliness, and there was always manifested the spirit of industry and thrift. George always spent his evenings at home, but in such a manner as to add either to his earnings or his knowledge. Thus their lot was a happy one, sweetened, as it were, by successful toil, and with bright prospects for the future.

About a year from the time they commenced housekeeping in their little home a son was born to them, whom they christened Robert,

for his grandfather. This boy was destined to become one of the great engineers of the period. He was twice called to America for professional service, once to South America, and again when the Victoria Bridge was built across the St. Lawrence, near Montreal, Robert Stephenson was the chief engineer and architect. Realizing what a handicap the want of scientific training had been to him, George resolved to give his boy every opportunity possible to acquire an education. Fortunately his advancing fortunes enabled him to carry out his plan.

When Robert was a little more than a year old his mother died of consumption.

Shortly after this, Stephenson received an offer to go to Scotland, and superintend the working of one of Bolton & Watts' engines, an offer which he gladly accepted, since it gave him an opportunity to study the most highly perfected engine of that period. After remaining away a year, he returned to his old home to find that his father had met with an accident which injured his eyes so that he was blind. The old man had spent all his savings and was badly in debt when his son returned. George had saved twenty-eight pounds while in Scot-

land, and he at once paid all his father's debts amounting to fifteen pounds. He then moved his aged parents to a comfortable cottage, where they spent the rest of their days in comfort, supported by their son, George.

Stephenson immediately found employment at fifteen shillings a week, but his outlook on the future was not very hopeful. The condition of the working classes was then very discouraging. England was engaged in a great war which severely taxed the industrial resources of the country. Taxes were excessive, making the cost of living high, while work was scarce and wages low. At the same time the poor were being pressed into the navy or drafted into the army. Stephenson was drawn for the militia and must either go as a soldier or furnish a substitute. He chose the latter alternative, and by paying out all he had saved and six pounds more that he borrowed, he supplied a man in his stead. Thus all of his hard-earned savings were swept away at one stroke.

Those were dark days for the working people of England, and George, like many others, contemplated emigrating to the United States. But his duty to his poverty-stricken parents and his love for his little son influenced him to

remain in England and work out his career as best he could.

During the next six years, Stephenson's wages as engineer were never more than twenty shillings a week. But he added to that by all manner of odd jobs. He repaired shoes, mended clocks, cleaned and repaired watches, and in that way added many an honest shilling to his meager income. He was also frequently asked to go to neighboring engines, where other engineers failed to understand the cause of their failure to work properly. On one such occasion he was called to see an engine at one of the collieries, belonging to the "Grand Allies," a company of which Lord Ravensworth was the largest owner. The engine had refused to work, the mine had filled with water, and operations had been suspended for more than a month. Stephenson saw at once what was wrong, made the necessary changes, and in less than a week had the mine pumped dry, so that work was resumed. That was a very fortunate circumstance for Stephenson, as the Grand Allies was the largest mining company in England, and Lord Ravensworth and the other owners were so well pleased with what they learned of Stephenson's capabilities as an engineer that they of-

fered him the position of chief engineer of the Killingworth Mines, at a salary of one hundred pounds a year, and the use of a horse to ride when making his tours of inspection. Stephenson was now relieved from manual labor, having advanced to the grade of a high class superintendent.

For a long time he had been giving attention to the locomotive or traveling engine, as it was called, though it was at that time regarded in the light of a costly toy and of no practical use. He was familiar with the work of the pioneers who had preceded him. Briefly summarized, the facts are these: There are three inventors, who stand highest in the list of those who originated the railway locomotive — Richard Trevithick, Timothy Hackworth, and George Stephenson, all Englishmen. Trevithick designed and built the first locomotive that would actually go and pull a load, in 1804. It contained many of the elements of the modern locomotive. The fire-box was surrounded by water; it had two cylinders with cranks set at ninety degrees. The exhaust went into the smokestack, though not arranged or intended to produce a forced draught and accelerate combustion; and it depended upon the friction of a smooth iron wheel

upon an iron rail for traction. The power was transmitted to the driving axle by a train of spur gears, which proved defective. Trevithick lacked the practical element, and evidently had no conception of the possibilities of the locomotive. So the one engine which he constructed proved of no practical value.

Seven years passed before Hackworth took up the work. But he failed to see the importance of the steam blast for creating a forced draught. He also had what was then the prevailing idea, that a toothed wheel must be used to get sufficient traction, and when the machine was tried out, it could only make steam to run continuously at about two miles an hour. Then the cog wheels tore up the track, and after being in use for a short time it was found more expensive than horse traction and was abandoned.

So it remained for George Stephenson to overcome the engineering obstacle in the way of mechanical and economic success, and what was more difficult to overcome, the ignorance and prejudice of the public, and place the locomotive where it belonged, the unrivaled motive power for railways. When Stephenson had been chief engineer for the Grand Allies about a year, he tried to convince the directors that

they could save money by using a locomotive in the place of horses to draw the coal wagons on the railway. None of the directors except Lord Ravensworth had any faith in the locomotive. He favored it, and it was with his money that the first really successful locomotives were built, and George Stephenson was the designer and builder.

When his first engine was tried out, it proved defective, and several of the parts had to be reconstructed before it would work satisfactorily. When completed, it was placed upon the Killingworth Railway July 25, 1814, and continued in operation for more than a year.

But the mode of communicating the power of the engine to the driving axles was the same as with the Trevithick machine, with spur gear, and it proved so unsatisfactory that Stephenson was convinced that the connection between the pistons and the driving axle must be as direct as possible, and so he adopted the method that has been in use ever since: namely, cranks on the ends of the axle set at an angle of ninety degrees, and a connecting rod from the crank-pin to the crosshead, so that the axle becomes the crank-shaft of the engine.

Then to communicate the power to the other

axles, horizontal connecting rods were used, the same as those on the modern locomotive, thus securing joint adhesion of all the wheels.

Stephenson took out a patent for that construction, which combined in a remarkable degree the essential elements of the modern locomotive. The date of the patent was February 28, 1815. It did not have the multitubular boiler, so was never capable of high speed. But in proof of the correctness of the design and the excellent quality of the workmanship of those early engines, we cite the fact that Stephenson's locomotives made between 1815 and 1818 were still in use and worked economically as late as 1860.

Up to 1821 all the railroads, with one exception, were built for private use and for the transportation of coal and other minerals. Also as late as 1825, or ten years after the locomotive had been shown to be mechanically and economically successful, horses were used as motive power on most of the railroads. The one railroad that was built for public use failed to furnish profits for the stockholders, and was soon abandoned.

For nearly twenty years the building of railroads was not looked upon as a means of profit,

and the English capitalist then, as always, was looking for profit. Some of those years are memorable on account of the joint-stock mania that swept over the nation. Companies were formed to build almost everything but railroads. There were the vast stores of coal in the district west of Darlington, in the county of Durham, but it was worthless, as there was no way to get it to tide-water. The only means of transportation thought of was by water or horse-drawn vehicles. In 1818 a company was formed to connect Darlington with Stockton-on-Tees by means of a canal. Enthusiastic meetings were held in both towns, and it was decided to apply for a charter if funds were forthcoming. Never was there greater virtue in an "if." Funds sufficient were not forthcoming. Then it was that Edward Pease, aided by several other energetic men of Darlington, formed a company for the purpose of considering the practicability of a railroad from Darlington to Stockton. In getting up the company and surveying the route, the greatest obstacles were encountered. But opposition and predictions of failure did not discourage Edward Pease. A hasty survey of the route was made and an application for a charter was entered in 1818. It had to run the gantlet of

fierce opposition in three successive sessions of Parliament. The first application was defeated largely through the influence of the Duke of Cleveland. The ground of his opposition was, that as the road was surveyed it ran through one of his fox covers. A new survey was made and a route selected that could not be objectionable to the foxes, and a new bill for a charter entered, and would have passed had not Parliament been dissolved on account of the death of George III. But early in the session of 1821, though strongly opposed, the bill passed both houses, and the charter for a railroad from the interior of the county of Durham to Stockton-on-Tees was granted.

Nothing was said about carrying passengers, and nothing about locomotives, the purpose of the railroad being for the transportation of coal and other commodities. Even Edward Pease, who was said to be a man who could look ahead a hundred years, had no conception of the possibilities of the railroad and its effect on the industries of the nation. Several months passed after the charter was granted, and nothing had been done toward the construction of the railway, when one day, near the end of the year, two strangers knocked at the house of

Mr. Pease in Darlington, and the message was brought to him that two gentlemen from Killingworth wished to speak with him. They were invited in, and one of them introduced himself as Nicholas Wood, and he introduced his companion as George Stephenson, the engine-wright of the Grand Allies Collieries of Killingworth. Mr. Pease liked the appearance of Stephenson. As he afterward said, "There was such an honest look about him, and he seemed so modest and unpretending, and his knowledge of railway building and other departments of engineering was so thorough, that I saw that he was the man we needed to superintend the construction of the Darlington and Stockton Railway."

But Mr. Pease was not prepared for the bold statement of Stephenson that the locomotive was the power to use, and that they would ultimately entirely displace horses for drawing cars on railways. "Come and see my engines working at Killingworth," was Stephenson's reply to the objections to the locomotive raised by Mr. Pease. Shortly after the interview, Mr. Pease, accompanied by some of the other stockholders, went to Killingworth, saw the Stephenson locomotives at work, and was con-

vinced that all the claims made for them were true.

The result of the visit was that Stephenson was employed as chief engineer and superintendent of the construction and operating of the Stockton and Darlington Railroad at a salary of three hundred pounds a year. The first thing that Stephenson recommended, after accepting the position, was that a new charter be obtained allowing the use of locomotives and the carrying of passengers. The charter was granted in 1823 and was the first to allow the use of locomotives for passenger traffic. As soon as the survey was completed, the work of construction began. Stephenson had no staff of experienced assistants. The only draughtsmen he had were some of his pupils whom he was instructing in the art of mechanical drawing. Stephenson, although self-taught, had become very proficient in that art. During the building of the road, Stephenson's efficiency in organizing and directing the labor of a large number of men eminently displayed itself. Railroad building was a new industry and a vast number of tools and implements had to be designed and constructed to expedite the work, but Stephenson was always master of the situation.

The first rail was laid with appropriate ceremony the 23d day of May, 1822, before the final charter had been granted. The road was completed in September, 1825. During the time the railroad was building, Stephenson, aided financially by Mr. Pease and a Mr. Thomas Richardson, had established a factory for the manufacture of locomotives, with Robert, his son, as superintendent.

As the time for the completion of the road drew near, the question of the kind of power to be used was being discussed by everybody. The press was unanimously opposed to the locomotive, and most of the papers even were against the "new-fangled" road, as it was called. But in the face of all criticism, the directors ordered three of the Stephenson locomotives to be on the ground at the opening of the road.

Tuesday, the 27th of September, 1825, was announced as the opening day. It was a great day for Darlington. A large concourse of people had gathered from the surrounding towns to see the trial, and Darlington made it a holiday. On each side of the track people on horseback, in carriages, and on foot were lined up striving to secure a place of vantage and discussing the possibilities of the new method of locomotion.

Would it be a success or failure? Opinions were about equally divided.

The road was for a short distance up an incline, and the cars were hauled up and lowered down on the other side by stationary engines. At the foot of the incline the train was made up. It consisted of, first, locomotive number 1, driven by George Stephenson. Next six wagons loaded with coal and flour. Then the passenger-coach, which was a little wooden house on wheels, with two seats on the inside running lengthwise. This was occupied by the directors and stockholders. Next twenty-one coal wagons jammed full of passengers; and lastly six more wagons loaded with coal. There were in all four hundred and fifty passengers, and the total weight of the train was about ninety tons. When all was ready, the bugle sounded for the start, Stephenson opened the throttle, and off started the train, a horseman carrying a flag riding ahead, warning people to keep off the track. They made the run to Stockton, most of the way at about four miles an hour. However, at a favorable part of the road, Stephenson called to the horseman to get out of the way and he put on the steam, and the speed increased until they were moving at what was then

thought the remarkable speed of fifteen miles an hour. At Stockton the whole population turned out to meet the procession. The directors and stockholders, led by a band of music, were escorted to the town hall, where the inevitable dinner wound up the proceedings. The return trip was made without accident or incident worthy of note, and the first attempt to transport passengers in railroad cars drawn by a locomotive had been made, and was successful.

It was a great triumph for Stephenson. And much credit must also be given Edward Pease and his associates who so ably and courageously financed the enterprise and made it economically possible.

But there were even greater triumphs awaiting Stephenson in the near future. Before the Stockton and Darlington road was completed, a charter was obtained for a railroad from Liverpool to Manchester, a distance of thirty miles. George Stephenson was selected as chief engineer to superintend its construction. The work of construction began in 1826. In 1829 the road was nearing completion, and the question of the motive power moving the cars was under discussion. The success of the locomotive on the Stockton and Darlington road

had not been such as to cause the entire displacement of horses, and the directors of the Liverpool and Manchester were of the opinion that horses would be cheaper and more reliable. So Stephenson stood alone in advocating the locomotive. But by his persistent earnestness he finally persuaded the directors to offer a prize of five hundred pounds for the best locomotive, the same to be determined by a competitive trial, the winning engine to comply in the best manner with the specified requirements. All the requirements but one were not difficult, but that one proved a stumbling-block for all but the winner. The condition referred to was this: The locomotive, with water and fuel, must not weigh more than six tons, and must be able to draw after it a load of twenty thousand pounds, for seventy miles, at an average speed while running, of ten miles an hour, with a steam pressure in the boiler of not more than fifty pounds to the square inch; the date of the trial to be October 1, 1829.

The success of the Stephenson locomotives had resulted in creating great interest among engineers, both in England and on the Continent. As a result, there were four entries, but none, with the exception of the Stephenson

engine, called "The Rocket," was able to comply with the requirements. "The Rocket" was in most respects like a modern locomotive. The boiler was multitubular, and the draught in the smokestack was forced by the steam jet. It was the first locomotive ever built with that combination, and it is that which gives the locomotive its great tractive efficiency and enables it to pull heavy loads at great speed.

It is interesting here to note that "The Novelty," one of the three that failed, was built by John Ericsson, the Swedish engineer, afterwards famous as the designer of the "Iron-Clad Monitor." "The Rocket" was on the ground ready for the contest on the day appointed, but the trial was twice postponed to allow the others to get ready. But when it did take place, "The Rocket" was the only engine to fulfill and more than fulfill the stipulated requirements. It covered the seventy miles pulling the load required, at an average speed of fifteen miles an hour, or one half faster than the ten miles required. The highest speed attained, with full load attached, was twenty-nine miles, or nearly three times the speed one of the learned judges declared before the trial to be the limit of possibility. But uncoupling the engine from the

cars, it was run back and forth on the track at thirty-five miles an hour, greatly to the astonishment of all, and surpassing the expectations even of the Stephensons. So the prize of five hundred pounds was awarded to Stephenson, and the company bought "The Rocket" for five hundred and fifty pounds, and it went into regular service on the Liverpool and Manchester Railroad.

"The Rocket" showed that a new power had been born into the world, with boundless capabilities, and destined to produce the most profound effect upon the social and industrial relations of mankind.

If the great men of history are to be ranked according to the benefits their achievements bring to humanity, then George Stephenson must be classed as one of the greatest men of modern times.

SOME DANGERS THAT MENACE A NATION LIKE OURS

1914

In order that we may discover the cause and nature of the evils that afflict a nation like ours, and determine whether the menacing dangers they bring may be prevented, and if so, by what means, we must first form a comprehensive and definite idea of what our nation is like. So we begin by calling attention to the fact that the character or status of a nation depends upon three principal factors. The first to be mentioned would be the people, whose physical and intellectual characteristics are so important in determining what a nation is like. The second element to be considered would be the country that constitutes the geographical domain, its extent, together with the natural resources which determine the character of the national environment. And lastly, we have to consider the relation which the nation as a whole bears to other nations, or the international environment. The difference between this nation and other nations, when a comparison is

made, must be accounted for by a variation in one or more of those three factors.

It is unnecessary for me to do more than briefly mention the fact that with our enormous extent of territory, furnishing such a great abundance and diversity of natural resources, and with a remarkable climate, this nation has been exceptionally favored. Also it is a familiar fact that our peculiar geographical location renders the protection of this nation from foreign aggression relatively easy, so that we can safely reduce militancy to a minimum, thus enabling our people to devote their activities to those industrial pursuits by which our wants are supplied and our lives made complete.

But the limits of this paper will not permit an extended consideration of those subjects, interesting and profitable though it might be, so we pass on to a brief consideration of the other element, namely, the people, or the human factor that is so important in determining what our nation is like, and the dangers to which it is exposed. With a nation like ours, or with any other, national character is simply the average character of the constituent units of which it is composed. To know what man is collectively we must know what he is individually. The pop-

ulation of the United States is highly cosmopolitan, and, with the exception of the few remaining aborigines, have all descended from the races of the eastern hemisphere. Since this department of our subject is considered in detail later, we here call attention to some general facts and principles which are of the greatest importance in their bearing on the social problems we are considering.

The adoption of the so-called evolution theory has completely revolutionized our ideas concerning the origin of the human species, and our theories relating to the intellectual and moral nature of mankind and its relation to the lower animals. In accordance with that theory, we have moved the antiquity of the human species back from five thousand to five million years, and now regard his origin as the same as that of other species, and that civilized man has reached his present status by a series of progressive steps, individually slight, but almost infinite in number.

The cardinal principles of evolution which affect our theories of social evil and social reform would be stated as follows: First, all physical and intellectual characteristics are such as tended to fit the species to its environment

at the time they were developed, and were produced in accordance with the law of the survival of the fittest. Second, in accordance with the law of inheritance, highly developed characteristics are transmitted to subsequent generations in a greater or less modified form after the environment which produced them has changed. Hence, those traits or propensities of mankind which were developed during his life in the jungle, and which fitted him for that environment, have come down in a modified form to civilized man, and unfit him for the environment which civilization furnishes. Thus the evil in our natures is the remnant of the effects of that life in the jungle of our early ancestors. And in accordance with the same law those characteristics have been developed which fit humanity for the environment which highly developed industrial society furnishes. Thus there have been developed those moral sentiments which we call honesty, justice, and beneficence.

Now, the most important fact to be noted in the application of these principles to our social problems is the immense period of time required to produce changes in the character of a species, and this principle applies to the human species the same as to all others. But

changes in environment may come quickly. The bearing of these facts on methods of social reform is readily understood.

We may now state as a fundamental truth that all social evils result from the non-adaptation of the physical, intellectual, or moral constitution of the people to the environment in which they are placed; that non-adaptation of constitution to environment depends upon such a multitude of conditions and circumstances that the diseases of society are the most difficult to diagnose or to cure. And yet, the solution of such problems of national scope is left in most cases to the average citizen who must act and vote, and decide before he votes, with no special training or aptitude for such a function, and with but little knowledge on which to base his conclusions, save that distorted information which he gathers during a political campaign, and which is handed out by the office-seekers and interests that care more for his vote than for his welfare or for the welfare of society. So in a government like ours the laws and policies of the nation are determined more by majorities than by patriotic and scientifically trained experts. Before election the cry is, "The people should rule." "Give the people

what they want." And therein lies the danger. We sometimes get what we want, but many times we want what we ought not to have.

We are well aware of the fact that any attempt to solve, by scientific methods, many of our social problems, particularly those that relate to economics or the business of the nation, is met at once by the criticism that such a treatment of the subject is merely academic, and although the principles cited and the conclusions reached are admitted to be correct in theory, the theory, it is said, will not work. To say that a correct theory will not work is equivalent to saying that two and two are not always four. If a theory will not work, it is because it does not harmonize with all the facts. In other words, because it is not correct. So the dangers to which our attention is first called are those which result from referring for their solution social problems, the most complex and difficult to understand, to those who have little natural aptitude and no special training for such a task.

It is a significant fact that the less we know about physiology and the science of pathology, the more faith we have in the efficacy of specifics. So, when we are ill, instead of seeking the

cause and removing it if possible, and trusting to the recuperative powers of nature to effect a cure, we take a dose of medicine; and since we get well, we innocently imagine that the medicine effected the cure. We neglect to recognize the fact that we probably should have recovered if we had not taken the medicine, for most people are ill many times, but with one exception they always recover.

This same tendency is manifested in our treatment of social evils. Instead of recognizing the fact that social evils are caused by a want of correspondence between the character of the people and their environment, and trying to effect a cure by such changes in character or environment as is possible so as to effect a better correspondence, we listen to the social reform quack doctor, and unthinkingly accept his diagnosis of the case and swallow his specific. But the medicine does not effect a cure, for we find after a fair trial that we have been treating the symptoms and not the disease, and the evil still remains.

So the first lessons that the social reformer should learn are: that to discover the cause of an evil is of first importance; that great and permanent reforms never come quickly, do not

depend upon any one man or any set of officials; and that social evils cannot be cured by legislative specifics. To quote from Herbert Spencer, "The notion that faulty character can so organize itself socially as to get out of itself a conduct which is not proportionately faulty, is an utterly baseless belief." Or, as David Starr Jordan expresses it, "You cannot expect society to be much better than it is now, so long as it is made up of such people as you and I."

The want of harmony between character and environment is a necessary concomitant of progress. That social growth which we call progress is never symmetrical. Changes come intermittently and in places, and social unrest and discontent furnish the motive power that propels the machinery of adjustment.

When we comprehend the fact that in its totality national character and national conduct harmonize, we are prepared to understand that the law of conservation of energy applies to moral as well as to physical force, and that with the dynamics of society, action and reaction are equal and opposite. Hence, if all the moral energy of society is expended in attempts to cure incurable ills, there is none left for practical and legitimate use.

We cite as an illustration of this principle the working of the prohibitory law in Maine. During a residence of fifteen years in one of the manufacturing cities of that state, an excellent opportunity was afforded for studying the working of the law, and these are the facts that were discovered, and the conclusions deduced. At the annual election for mayor and city government, the real issue was, Will this or that candidate enforce the prohibitory law? A majority of the voters frequently elected the man who they thought would not enforce the law; and if the majority got what they wanted, they elected a man who would take his oath of office, solemnly pledging himself to enforce all of the state and municipal laws impartially, and then accept bribes for immunity. The rum traffic was thus licensed, the revenue from the system forming a corruption fund that demoralized the entire city government, including not only the police force, but other departments as well, as indicated by graft, dishonest practices, and a general lowering of the standard of official probity and efficiency. So that what was gained directly by promoting the cause of temperance, and by eliminating those evils that spring from intemperance, was lost by the reaction that

resulted from attempting to enforce a law designed to protect a man against his own appetite which public sentiment did not support.

So our student of social science concluded that the remedy was as bad as the disease. Now, while recognizing the fact that intemperance in the use of alcoholics is one of the greatest evils, and while we regard that impulse which prompts honest effort to eliminate or mitigate the evils as commendable, we still maintain that the moral energy expended in the form of legal restraint is for the most part wasted. Furthermore, the good that does result from the application of such a remedy does not come directly from the successful working of the law, but indirectly through the educating influence which a campaign for temperance usually promotes. And, in concluding this reference to the temperance question, allow me to say that the wealthy and respected citizen who votes no license when the question is submitted to the people, but who uses and approves the use of alcoholics as a beverage, is a greater enemy to the cause of temperance than the poor man who honestly votes yes, because he wants a more convenient place to buy his beer. And the woman who is the mother of a family, or has

any influence in society as a progressive leader, can accomplish vastly more for the cause of temperance with the educating influences she can exert, by teaching at all times, by precept and example, that total abstinence is the only safe temperance, than by expending her moral energy forcing her way to the ballot box to vote for prohibition.

Another class of evils we notice is that which results from the national policy we have adopted for fostering and promoting the private industries of the nation by methods that are in violation of the fundamental principles, not only of social economics, but, what is more dangerous, the basic principles of justice and morality upon which the life of a nation like ours depends. The Declaration of Independence was a protest against tyranny and injustice and the announcement of the basic principle of a democracy, namely, that all men are created with equal rights to life, liberty, and freedom in the pursuit of happiness. These rights, it was claimed, are inalienable, and to secure them governments are instituted. Thus it is that the primal and legitimate function of a government like ours is the enforcement of justice, the securing to its citizens equal freedom. Whatever

other functions may be assumed to be legitimate, that one duty of securing equal freedom will always remain the first and most important duty. To that principle all laws must conform. That was the sentiment and spirit of this nation at its birth, the spirit of '76.

After the War for Independence was over and peace declared, and the constitution had been adopted by the thirteen original states, there came in 1789 the first meeting of Congress. After the organization was completed, the first business that came before that body was the raising of revenue to liquidate the debt incurred by the war and to provide revenue for the ordinary expenses of the government. It was decided to raise the revenue by a tax on imports, as we had at that time a relatively large commerce with other countries. A ways and means committee was appointed and a tariff bill reported, the principal if not the sole object of which was to raise the revenue. Commerce at that time with the West Indies was brisk, particularly with Jamaica, and the commodity of greatest importance coming from that island was rum. The second important import was molasses, which also came from Jamaica. There was practically no molasses produced in

the United States, but the manufacture of rum was an important industry. Also the rum manufactured in the United States was made from molasses that came from Jamaica. At once there arose the demand on the part of those interested in the manufacture of rum that molasses either be admitted free, or the duty made as small as possible, because it was a raw material; and that the duty on rum be made so high as to afford protection and secure the home market for the domestic industry. And as the bill passed, the duty on rum was fixed at fifteen cents a gallon, and that on molasses at six cents, and since a gallon of molasses made a gallon of rum, there was a net advantage to the domestic industry. Therefore, the duty enabled the domestic producer to raise his price, and the consumer was taxed whether or not any rum was imported or the government obtained any revenue. It was thus that the serpent entered the Garden of Eden, and the Goddess of Liberty, that innocent maiden, accepted the forbidden fruit. And while in our imagination the tones from the Liberty Bell were still reverberating among the hills and vales of the nation, proclaiming this a government pledged to give equal rights to all and

special privileges to none, Congress, influenced by special interests, was passing laws which in their effect were taking one man's property and turning it over to another, which, although done in the name of law, was no less robbery.

It would seem unnecessary to offer other evidence in condemnation of the protective feature of our tariff laws after they are shown to be in violation of the fundamental moral principles upon which our government is founded, but since it is a fact that the promoter of the protective system is influenced more by his pocketbook than by his conscience, we feel compelled to glance briefly at the economic side of the question. So we begin by stating certain self-evident truths. A protective tariff is governmental interference with international commerce. The object of that interference is to raise the price of the imported article so that the domestic producer can undersell the foreigner and secure the home market.

Let us see what commerce is, and what it does. Commerce is exchange of commodities among individuals. When we speak of interstate or international commerce, we mean commerce among individuals living in different states or nations. I cannot recall an instance

where one of the states ever bought anything of another state, but we distinctly remember when the United States bought the Philippine Islands of Spain, and in that transaction a great many people think that it was the United States, and not the Philippine Islands, that was sold.

The fact here recognized is that the commerce of the world is exchange among individuals, and that the benefits or injuries that result therefrom do not depend upon whether the parties to the transaction live in the same town, state, or nation. The principles of exchange are universal in their application. All that commerce can do is to enable individuals to devote their activities to those industries for which they have the greatest productive capacity, and thus secure the greatest economic benefits. The mutual benefits that result from exchange constitute the only motive for commerce that is in any way economic. And it is no more reasonable to assume that this nation as a whole is benefited by interference with international commerce than it would be to assume that Massachusetts would be benefited by some great catastrophe which rendered commerce with all the rest of the world impossible.

Simple as this may seem, it is all there is to the science of international exchange. Therefore governmental interference with commerce between nations is never justifiable for reasons economic. But only, if at all, as a military expediency in times of war, as for instance when we blockade our harbors.

Could it be expected that the ultimate consequences of a system of laws in direct conflict with the basic principles of ethics and economics could be other than injurious? The original sin of our first parents, it has been said, resulted in the total depravity of the human race. That original sin of the Congress of 1789, if it has not resulted in the total depravity of our political system, has been productive of so many evils that we classify it as the most potent cause of political corruption and official graft.

The dangers that come from the corrupting influence which such a system has had upon Congress, and the instability of business conditions resulting therefrom, can hardly be overestimated. Whenever a tariff bill is before Congress, the lobby is at once packed with representatives of the interests fighting for every possible advantage and every special privilege

which can be gained for enriching the interests they represent at the expense of the rest of the nation. And many of our Congressmen, instead of considering that their constituency includes all the people of the district they represent, or that they have any duties to the nation as a whole, think only of the interests that financed their campaign and furnished the money that secured their election. When, during a political campaign, millions of dollars are spent by the great corporations to insure the election of the candidates they are supporting, is it reasonable to suppose that they simply want an administration that will give us laws that are just and equitable, and for the welfare of the country as a whole, and that they expect no special favors as a return for their outlay? Such a supposition is absolutely unfounded. The contributors expect to get their money back and a great deal more besides, and it would be an unjust criticism on their business sagacity to conclude otherwise. So the people are made to believe during a political campaign that the prosperity of this nation, particularly the prosperity of this or that locality, depends entirely upon the action of Congress and the conduct of the Administration.

And so the tariff issue becomes a local issue, and the appeal is always to local and class selfishness, and never to those broad and statesmanlike principles of justice and impartiality upon which the welfare of this nation depends. Thus it is that the stability of the business of the nation is made to depend not upon honest and skillful management with strict attention to industry and economy, but instead it is made to depend upon the political complexion of Congress as indicated by its attitude on the tariff issue. So sensitive are the business interests of this nation to changes in our tariff schedules, that it was said by the advocates of protection during the last campaign that the panic of 1893 was caused by the Wilson Bill, which was not enacted until a year and a half after the panic had reached its greatest intensity.

As a safe and stable foundation for the business of the nation, could anything be more inadequate than a protective tariff?

Lest we be misunderstood, we again call attention to the fact that not only is real progress never rapid, but the same is true of retrogression. They each can only keep pace with the physical, intellectual, and moral changes in

the social unit. So it is not the direct consequences of bad laws that are most to be feared, but rather those insidious and cumulative influences which result in lowering the standard of national morality and efficiency.

The persistence of evil and its tendency to acquire momentum and wax strong and bold with age are nowhere displayed more clearly than by the results of our system of promoting our domestic industries by interfering with foreign competition. Our industries, which we nurtured so tenderly during their infancy, have grown to be giants; they have celebrated their hundredth anniversary, and still we are unable to say of them, as Micawber did of his twins, that they no longer derive sustenance from nature's fount. Our infants have never been weaned. And when any attempt is made to accomplish such a result a howl goes up the volume of which can only be accounted for from the fact that the infants have had a hundred years' practice. Furthermore, the interests not being satisfied with excluding foreign competition have, during recent years, succeeded in eliminating domestic competition by combinations and agreements which have culminated in those gigantic corporations we

call trusts, which monopolize many of our manufacturing industries.

Now, while we do not contend that governmental interference with commerce has been the sole cause of the evils manifested by the trusts, we do assert that the protective tariff has been a potent factor in their successful establishment, and we also contend that placing all commodities made by trusts on the free list would remove most of the economic burdens they impose.

But another evil claims our attention, which promises to bring dangers more menacing than any of those already mentioned. We refer to the changes in the character of our people caused by immigration.

The population of the United States may be divided into three classes: First, the native-born Americans, whose European ancestors are so many generations removed that their American descendants have become adapted to their environment and can be said to have inherited the American national character. Second, those people who were born either in this country of foreign parents, or in foreign countries, but whose ancestry for many generations were of Teutonic or Anglo-Saxon origin. This class

quickly become Americanized, and adopt our customs, manners, and standards of living and morality. In the third class we place the foreign-born and those of foreign parentage belonging to the Mediterranean, the Jewish, the Slavic, and the Oriental races. This class of immigrants and their ancestors for many generations have been subject to conditions and influences which have given them a character that is sadly out of harmony with the environment which America furnishes.

If we go back twenty-five years, two thirds of our immigrants were of Teutonic or Anglo-Saxon origin, while at the present time less than one sixth come from those easily amalgamated races. The British Isles, Germany, Scandinavia, and Canada jointly sent us ninety per cent of our immigrants in the decade ending 1870; while Russia, Austria-Hungary, and Italy during that decade furnished only one per cent; but they jointly furnished more than fifty per cent during the decade ending 1900, and more than seventy per cent the decade ending in 1910. Thus it is evident that a great change has taken place during recent years in the character of our immigrants and the sources from which they come. As Pro-

fessor Ripley says in his Huxley Memorial Lecture on the European population in the United States, "We have even tapped the political sinks of Europe, and are now drawing large numbers of Greeks, Armenians, and Servians."

As to numbers, there have come to this country since 1830 and up to and including 1911, 27,800,000 immigrants, and one quarter of that number have come in the last seven years, or nearly a million a year. In the one year of 1907, more than one and one quarter million immigrants came to this country. The newcomers of the last seven years would repopulate all the five older New England states as they stand to-day, and if properly disseminated over the newer parts of the country, they would serve to populate no less than nineteen states. "Do you wonder," as Professor Ripley says, "that thoughtful political students stand somewhat aghast?"

Now the evils that result from this avalanche of immigrants are caused more by the intellectual and moral status of the people that come than by the number. Notwithstanding the immense increase in our population by immigration during recent years, the United States is still one of the least densely popu-

lated of the great nations. If the population of the United States were twenty times as great as it is, we should then be less densely populated than England. But this immense volume of humanity from the lowest classes, this enemy to our high standards of living and morality, attacks us where we are weakest. Instead of being distributed wisely and broadly over our sparsely populated area, they either remain in the great seaport towns where they land, increase the already dangerous congestion where the recently arrived poor immigrants congregate, and thus furnish material for the slums of our great cities, or they flock to the manufacturing localities, where they transform our great industrial centers into veritable foreign towns. Even Massachusetts, out of a total of nearly one hundred thousand operatives in her textile industries, can count less than four thousand, or four per cent, of native-born Americans. Our cities like Lawrence, Lowell, Fall River, and New Bedford, where the textile industries are located, have such a preponderance of that low grade of population as to make local self-government difficult, and in some cases impossible, as was the case in Lawrence.

Now, there are two causes that will account in great measure for the recent changes in the number and character of our immigrants. First, the influence of the great transportation companies who have their agents in every country of the eastern hemisphere, where there are ignorant and credulous people who can be made to believe the fairy tales about the wonderful opportunities for making money in America. In that way the steerage of the immense liners is packed with humanity — no regard being paid to their physical, intellectual, or moral status; the only question being, Can the transportation company get the price of a passage?

Second, the great manufacturing industries of this nation, that are always clamoring for protection from the pauper labor of Europe in order that they may pay the high American wages, hold out every inducement for that pauper labor to come to this country, where they are employed to the displacement of the native Americans who cannot support themselves and maintain the American standard of living on the wages the foreigners are willing to accept. Some of our great corporations, as was shown in the congressional investigation of

the United States Steel Company, even go so far as to send out advertisements for help, offering to pay the fare of any they employ, and specify that Syrians, Poles, and Roumanians are preferred.

Can we conceive of a greater departure from the principle of the square deal? How long, we ask, will the wage-earners of this nation continue to ask for laws to protect them from foreign competition when the practical working of the law is such that the foreigner is brought to this country and a form of competition instituted that is much more damaging than that which the law was designed to prevent?

The situation of the wage-earner in the United States to-day is analogous to that of the man who was being pursued by a bear which he had wounded. Seeing that he would be overtaken unless he adopted some other means of escape, he climbed a tree. When he was up as high as he could get he looked down and saw that the bear with difficulty was coming after him, so he began to pray. "O Lord," he prayed, "protect me from this wild beast. Help me if you possibly can, but if you can't help me, please don't help the bear."

In the light of recent events, the immigra-

tion problem is one of greatest importance, and one that statesmen and students of political science find most difficult to solve. But during the time that our lawmakers are trying to find a solution of the problem and devise a law that will be just, safe, and effective, the patriotic citizen is saying, "Give us laws that will help us, if you can, but please deliver us from the laws that help the enemy."

As already indicated, a perfect society would be one in which each component unit was perfectly adapted to his or her environment. With such a society any change in industrial methods, even the adoption of labor-saving devices such as always accompany industrial progress, would temporarily impair social harmony and would be an evil until readjustment was effected. The following facts illustrate that principle: The industrial progress of the United States during the one hundred and thirty-six years of our national existence has exceeded that of any other nation, ancient or modern, for an equal number of years. These changes have come so rapidly, and the social and industrial balance has been so frequently disturbed, that we have been kept constantly on the alert making adjustments. These changes in industrial

methods are not due simply to the fact that our people are more intelligent and progressive, or that we occupy an immense area of territory with great wealth of natural resources, or that we have a superior form of government. All of these are important factors, but not the most important in accounting for our exceptional progress. Had they been the only factors, we should be doing the work of the United States to-day practically as it was being done in the days of George Washington. In looking for the real cause, if we go back to the time of the Declaration of Independence, we learn that events were taking place at that time vastly more important in their effect on the civilization of the world than the American Revolution. The invention of the spinning machine, the steam engine, and the power loom, all of which occurred about the time of the Declaration of Independence, ushered in a new era of social production, and we have witnessed during the first century of that era greater changes in industrial methods than had taken place in the previous three thousand years.

The characteristics of the new methods are the substitution of mechanical for muscular energy, the use of power-driven machines in

large manufacturing plants, or the establishment of the factory system, as a substitute for the time-honored régime of hand production where muscular energy was the power used, and where the industries were carried on either in the homes of the artisans, or in small isolated shops.

Is it surprising that the social and industrial harmony has been frequently impaired? When we consider the extent and rapidity of these industrial evolutions, and the fact that they have come to an industrial society the members of which have become adapted to conditions and methods that have been comparatively uniform for thousands of years, we realize that to maintain social order brings a great strain upon our democratic institutions. When we realize that changes in methods of production, transportation, and communication may throw thousands of people out of employment and furnish employment for other thousands, that new inventions consign to the scrap-heap millions of dollars worth of old machinery, while furnishing opportunity for large profits by the use of new machines and new methods of production, is it surprising that Congress and our state legislatures have been kept constantly

busy trying to maintain industrial stability and social harmony?

We seldom realize that in a nation like ours progress is accompanied by dangers as well as benefits. If we turn back in the path of social and industrial progress from highly civilized man to the savage, we find a constantly increasing individual similarity. Among savages all are engaged in similar industries which involve little or no diversity of employment. Thus they acquire a high degree of physical and intellectual similarity, but with civilized man the diversity of social and industrial functions is almost infinite. Consequently there results great physical and intellectual diversity. Every progressive step which brings greater knowledge gives mankind greater control over the forces of nature and makes brain energy relatively more efficient than muscular energy. So that one of the unavoidable consequences of industrial progress is to increase the distance that separates the skilled from the unskilled laborer, or that separates an Edison from the Italian who can only use the pick and shovel. To quote from Jordan, "A bushel of coal and a bucket of water will do the work of the unskilled laborer, and require but little

more superintendence." But, we add, the inventor does not have to compete with the forces of nature. He commands them to do his work, and they obey him.

If we interpret the Declaration of Independence literally, the self-evident truth that all men are created equal must have referred to the aborigines of America. It certainly was not true of civilized man, even at the time it was written. Since that time there has been a constantly increasing diversity of industrial capacity. Is it not evident, if the enforcement of justice secures to each the results of his or her activities, while requiring the activities to be carried on without interference with the equal freedom of others, that there will necessarily be great inequality of results? A democracy can never guarantee equal results, but only equal freedom and equal rights. Success must depend upon the man.

But if the state or nation cannot bestow charity upon the incapable, excepting where self-support is impossible, without a violation of the principles of justice, how much more reprehensible becomes that injustice caused by granting special privileges to the superior which enable them to secure results greatly

out of proportion to their capabilities? The right of eminent domain rests in the hands of the nation. At any time and in any place, when the welfare of society demands it, private property can be taken and devoted to public use. But when the state, by the exercise of that right, takes private property and turns it over to a corporation or to individuals to exploit for their benefit, an injustice is done that cannot be rectified by any system of governmental rate regulation or federal control of so-called big business.

All industries, such as transportation companies, street railroads, those supplying towns with water, gas, or electricity, or any industry which cannot be carried on without a public franchise involving the right of eminent domain, are justly subject to the absolute control of the power that grants the franchise. And all value that inheres in such franchise must always remain the property of the public. Hence the right to control depends not upon the fact that the business is big, but upon the fact that it could not be established and would not be carried on without a violation of the principles of justice. And whenever justice cannot be secured and leave capital a satis-

factory margin of profit, then justice must prevail, though capital perish.

Whether we are considering the constitution and laws of the nation, or the rules and regulations of labor organizations, or those methods of production and distribution we call socialistic, the first question should always be, Does the law, the rule, or the method harmonize with that equal freedom which we call justice? If not, it stands condemned before the highest tribunal on earth. The great calamities that have come to this nation have resulted from a departure from the strait and narrow path of justice. Setting aside the principles of justice in favor of economic expediency, in the case of the colored people of the South, cost this nation a million lives and billions of wealth.

We have already pointed out the corruptions and great dangers that result from unjust interference with commerce. We see in our labor troubles the dangers that result from interference with the equal freedom of all to work wherever, for whomsoever, and for whatever wage they wish. And the menacing evils that result from granting special privileges to those who are fully capable of taking care of themselves are familiar to all.

All such evils can be prevented by a strict enforcement of justice, and they will yield to no other remedy. But most of the suffering of humanity does not result from injustice. It comes from the unavoidable consequences of our imperfect natures; and the remedy is in better men and better women, and the mills of the gods grind slowly.

The distribution of wealth, if just, must necessarily be unequal, and any law, custom, or system of production and distribution that makes it as profitable to be ignorant, incapable, and lazy as to be intelligent, industrious, and efficient, is directly opposed to progress and higher civilization.

The initiative, the referendum, and the recall will not make a man free who is a slave to drink, or give a living wage to those who are unable or unwilling to earn it.

So the prison in which we are confined is, for the most part, of our own construction, and the door cannot be unlocked by Congress or the state legislature. Yet, with man as he is, the necessity for a government is absolute, for justice without a constitution and laws is impossible. Also a government without justice cannot permanently endure.

THE SCIENCE OF MAKING A LIVING

1912

Of all the sciences which mankind has attempted, the most extensive, the most highly complex, and consequently the most difficult to fully comprehend, is the science of making a living. A comprehensive treatment of the subject in its broadest application would comprise many volumes, and they would have to contain a record of all that knowledge which relates to the maintenance of the physical existence of the human race.

In that highly complex industrial society in which we are living, making a living means vastly more than simply keeping soul and body together. It means supplying all the physical, intellectual, and moral wants by activities consciously directed to that end.

This definition will be seen to contain two distinct ideas. First, the idea of what constitutes a living, and, second, of how it is obtained. Since there is a great diversity in the nature and extent of the wants and the ability

to supply them, there is no uniform standard of living, but the standard of each is determined by the wants and capabilities. Hence, what constitutes a living for one might not for another. Secondly, since the living is *made* by consciously directed activities, a distinction must be made between making a living and getting a living. Any one who makes a living may be said to be self-supporting, while one who gets a living may be supported by others. That support may be either consciously or unconsciously supplied, and if consciously, either voluntarily or by compulsion.

There are two ways in which the results of our activities in making a living are affected by the presence and activities of others; namely, we are either hindered or helped. The order of this classification will be seen to correspond with the evolution of industrial society. The increase in numbers finally compelled savage man to live in the presence of others, where he became first merely gregarious, but with no industrial coöperation, and where practically the only recognized effect of the presence and activities of others was the injurious effect. Then from the gregarious state he progressed to the social, which is distinguished from the

former by the conscious recognition of the advantages of coöperation, — first in aggressive or defensive warfare, and finally coming to realize the great benefits resulting from that coöperation which characterizes the highly civilized industrial group where the presence of each, actively engaged in making a living, is helpful to others similarly engaged.

The multitudinous ways in which the making of a living by one is hindered by the presence and activities of others may be classified under three heads as follows: First, the hindrance may be caused by the perverse or criminal conduct on the part of others; second, it may be the result of the physical or intellectual incapacity of those who are innocent of intentional wrongdoing; and, third, the hindrances may be caused by the presence of others in numbers so great as to encroach upon the possible bounds of subsistence.

Under the first heading would be included all the ways in which we are robbed, cheated, and defrauded from the crude and unpopular method of the highwayman, the burglar, or the ordinary thief, to the more subtle, more modern, and vastly more extensive methods of robbery adopted by the promoter, the stock

speculator, and all the numerous manipulators of frenzied finance, who prey upon society, and by their wits manage to get a living (and usually a good one), without devoting their activities to any of the industries or occupations which are essential. If all those who get a living in that way were justly dealt with, to see many of the faces now so familiar in Wall Street or any stock exchange, one would have to visit the penitentiary.

All those who are getting a living without making it, that is, without giving to society in some manner the equivalent in value of what they are getting, and who get what they do by dishonesty or some other form of injustice, hinder the rest of society who are making a living, and may be classified as undesirable citizens. And to the direct hindrances resulting from such perverse conduct, must be added the indirect consequences which include all the expense of maintaining those departments of government which have for their functions the enforcement of justice or the prevention or punishment of crime; and lastly must be included those hindrances which result from having to maintain at great expense an army and navy to protect the nation from those injuries

which other nations are supposed to be ready to inflict.

Without going further into the detail that would come under this class of hindrances, we pass on to the second, or those which are caused by the incapacity of others. Under this head would be included the expense of supporting those whose mental or physical incapacity renders them incapable of making a living, and they consequently have to be supported either by public or private charity. The aggregate expense of supporting the poor, and financing all of our many charitable institutions, — municipal, state, and national, — forms a very important item of our tax account.

The second item under this head would include the active class of the incompetent, or those who, in trying to make a living, engage in industries which they have not the ability to carry on successfully, the result being waste and failure, involving in the aggregate a vast amount of capital. In the United States in 1910 there were 12,652 failures, with liabilities in excess of assets amounting to more than $200,000,000. Many other hindrances might be enumerated under this heading, but, our time being limited, we will consider but one

more: That resulting from the conduct on the part of others, which, while it does not prevent them from making a living and consequently from helping us some, does prevent them from helping us as much as they otherwise would, and the consequent loss to society is enormous.

We refer to the use of alcoholic beverages and tobacco. The cost to the people of the United States during the year 1911 for tobacco and alcoholics was nearly two billion dollars. Now, without considering the direct injury to the people by their use, such as the injury to health, and the consequent lowering of the physical, intellectual, and moral capacity of the people, consider the enormous benefits that would have resulted from devoting that amount of capital to beneficial purposes. We get an idea of the magnitude of the loss when we consider that the amount expended would be sufficient to pay the entire national debt, the total cost of constructing the Panama Canal, and furnish the $440,000,000 devoted to war expenses last year. This enormous loss would have to appear under the heading of "the losses caused by the stupidity of mankind."

With this brief analysis, we pass to a con-

sideration of the third class of hindrances, or those which result from the presence of others in too great numbers to make it possible for all to make a living. That there is any immediate danger from such a condition of overpopulation in the United States hardly seems reasonable. If the population of the United States were twenty times as great as it is, this country would then be less densely populated than England, and yet at least twenty-five per cent of our population are just barely making a living, are on the very verge of want, and thousands are actually suffering from want, besides those who are supported either wholly or in part by charity. But, is the poverty, the want and suffering of the poor due to the fact that the possible bounds of subsistence have been reached? Is the earth being made to produce all it is capable of producing, while still some are suffering from want? We say no, it is not the niggardliness of nature, but the wickedness or stupidity of mankind that is the cause of poverty. There are not actually too many people in the United States, — only too many of a certain kind. We have too many incompetent, lazy, and vicious, but not too many honest, intelligent, and industrious citizens.

The ratio of population to the possible bounds of subsistence is constantly changing, and depends upon the intelligence and morality of the people, as well as upon the extent of nature. The theory formulated by Malthus, the English economist, in 1798, that population tended to increase by a geometrical ratio, while the increase in subsistence, due to the invention of machinery and improved processes of production was only arithmetical, is no longer regarded as correct. It has been disproved by the logic of events, the same as the theory was disproved that the price of silver and the price of wheat would rise and fall together. When wheat went from 65 cents a bushel to $1.10, and silver dropped from 65 cents an ounce to 43, the successful political career of one of our distinguished citizens ended. So the theory that the increase of population tends constantly to encroach upon the bounds of subsistence, in accordance with the theory of Malthus, is disproved by the fact of the wonderful industrial progress which has occurred since the announcement of that theory.

While it is true that there has been a great increase in the population of the highly civilized nations during the last century, the produc-

tive capacity of mankind, due to the introduction of machinery and improved processes of production and distribution, has increased in a much greater ratio. So that the population of the globe to-day finds its wants more amply supplied than at the time when Malthus announced his theory.

When the time will come that the resources of the earth, developed and utilized to the fullest extent by the increasing intelligence of mankind, are insufficient for the sustenance of the population then existing, I will not attempt to predict. Neither will the limits of this paper permit an extended consideration of the causes that prevent an increasing population from encroaching upon the bounds of subsistence. So, without further elaboration of detail, what has been said under the heading of hindrances may be summarized as follows:

All who get a living without making it hinder those who are making a living by depriving them of a part of the just rewards of their activities, either by violence, dishonesty, or some other form of injustice, or by their physical incapacity, stupidity, or laziness.

The next topic to be considered is the mutual helpfulness which the members of civilized

society render each other in making a living. The statement that a man is self-supporting when he makes his own living, does not mean that he supplies his wants directly. In civilized society he usually supplies them by exchange. But if he makes his living, that exchange must be fair, that is, value for value honestly delivered. That which he produces and exchanges for that which supplies his wants, must be produced by activities carried on strictly in accordance with the principle of equal freedom, or in accordance with the moral law.

In order to develop a theory which will explain the method by which the members of industrial society help each other, and how social groups are mutually helpful, we will begin with the simplest form of society, — a society composed of two (A and B), and fishing the industry in which they are to engage.

When approaching the bank of the stream where they are to fish, they find an obstruction in the form of a large bowlder, which must be removed before they can approach near enough to the shore to fish. Neither A nor B has strength enough to move it alone; so they combine; and both lifting at the same time, they roll the stone away. That represents the lowest

type of combination, and was the first to appear at the dawn of civilization. It is a coöperation without either division of labor or diversity of employment.

On reaching the side of the stream they begin their work, which may be divided into two departments, namely, baiting the hook and catching the fish. As the work progresses, it appears that A excels B in both departments. A can bait a hook in two minutes and catch a fish in four, or a total of six minutes. But it takes B four minutes to bait a hook, and eight minutes to catch a fish, or a total of twelve minutes. Thus A is twice as efficient in each department as B, the relative time being the same. That is, it takes both A and B twice as long to catch a fish as to bait a hook. A would then catch ten fish an hour, and B five, or a total of fifteen. Now, since A can catch a fish in four minutes, or in half the time required by B, and since B can bait a hook in four minutes, or in exactly the time required by A to catch a fish, they think by combining and dividing the labor they can catch more than by working independently. So B spends all his time baiting hooks for A, and A fishing all the time, catches a fish each four minutes, or fifteen an

hour. But no gain results from such a division of labor and specialization, and none is possible, so long as the ratio of the time it takes to bait a hook to the time required to catch a fish remains the same with each. Therefore, there would be no motive for division of labor and exchange of services, for reasons economic.

But let us assume that the relative capacity does not remain the same, but that A, by devoting all his time to fishing, becomes an expert in that specialty, and is finally able to catch a fish in two minutes instead of four, and that he would not improve in baiting hooks, so the time required would be the same as at first, namely, two minutes. Then if A worked alone he would bait a hook in two minutes and catch a fish in the same time, or a total of four minutes, or fifteen an hour. Also, if B spends all his time baiting hooks, he improves in that department, and reduces the time required from four to two minutes. But assume that he would still require eight minutes to catch a fish, as at first, or a total of ten minutes. He therefore would catch six an hour, which, added to A's fifteen, make twenty-one. Now, the ratio of efficiency in the two departments differs. For while A can catch a fish in the same

time he requires to bait a hook, it takes B four times as long to catch a fish as to bait a hook. Now they combine and specialize. B baits a hook every two minutes, and A catches a fish in the same time, and so they catch thirty an hour, a gain of nine over the total of twenty-one, when working separately. Under those conditions A could afford to hire B to bait hooks and give him as a wage nine fish an hour, or three more than B could catch working for himself, and still A would have twenty-one left out of the thirty, or six more than the fifteen he could catch without employing B. Hence, the motive of each for exchange of services.

Now it must be understood that it is not profitable for A to employ B to bait hooks because B can bait them faster than A, for the time required would be the same; but because while being equal in that department, A excels B in catching fish by a ratio of four to one. Even if A could bait a hook in one minute, or in half the time required by B, there would still be a gain by division of labor, for A would then bait a hook in one minute and catch a fish in two minutes, a total of three minutes, or twenty an hour, while B would bait a hook in

two minutes and catch a fish in eight, a total of ten, or six an hour, which, added to A's twenty, make twenty-six. But, by specialization and exchange, as shown in the previous example, the total would be thirty, or a gain of four over the twenty-six, if they worked separately. Therefore, it would be economical for A to employ B to do work that A could do in half the time, in order that both A and B might devote their time to that specialty for which they have the greatest relative productive capacity.

From these simple and rudimentary examples may be deduced the economic laws, in accordance with which the production and distribution of the wealth of the world must coincide if the best possible living is made for all.

The principles would be formulated as follows:

First, the simplest form of beneficial combination is that where activities are similar but, by being combined, accomplish results which could not be accomplished otherwise.

Second, where all the individual members of a social group are engaged in similar industries, and have relatively the same capacity for

each, there is no possibility of economic benefits resulting from division of labor or exchange of services, regardless of the actual differences that may exist.

Third, wherever there is a relative difference in the capacity for producing different things among individuals or groups of individuals, coöperation and exchange bring an economic gain, regardless of the actual differences that may exist.

Fourth, devoting the activities entirely to one department or specialty tends to increase the productive capacity in that specialty, thus creating a greater diversity of relative industrial capacity, hence affording opportunity for a greater gain from division of labor, specialization, and exchange.

Fifth, no division of labor or specialization is possible without exchange of commodities or services.

These principles are capable of universal application.

To summarize more briefly, we would say that the members of civilized society help each other by combination, by division of labor and specialization, which are made possible by exchange of commodities or services. As al-

ready indicated, combinations of the lowest form, that is, without specialization of industrial function, are found to exist among savage tribes, and to a greater extent in the next higher or militant type of society. But it is the industrial type that makes the most extensive use of combination, and it is there that a very important change in its nature and object appears. With the savage and the militant type of society the object of the combination is to destroy both life and property; but with the industrial type the object is to maintain life by creating wealth, or to produce in greater abundance those things upon which the maintenance of life depends. But it is by specialization and exchange that civilized society profits most. The two are necessarily co-related, for there can be no division of labor and specialization without exchange.

We often hear the remark that all work tends to run into specialties. It is more often spoken of with reference to professional work. In the medical profession, for instance, the general practitioners are becoming relatively fewer; and if we go to one for any serious ailment, he will simply diagnose the case and send us to the proper specialist. The same ap-

plies to all the professions. Even the clergy, who are supposed to teach that which is absolutely true, because its source is Divine Revelation, specialize. First, they differentiate into two classes — Catholics and Protestants. Then there are multitudinous subdivisions. If you are a Protestant and want the doctrine of John Calvin, you go to the Baptist minister who makes a specialty of that. If you want the theology of Wesley, you go to a Methodist, or if you want the doctrine of Mrs. Eddy, you know where to go for that, and so on, to the end of the list.

While we are all familiar with the facts, we hardly realize that the highly complex industrial specialization existing to-day is of quite recent origin. Some of us can remember when our native town, although having a population of less than 1000 inhabitants, was a quite complete industrial whole; that is, nearly all that was consumed in the town was produced there. We depended but little upon the rest of the world for our necessary supplies, and exchange or commerce with the outside world was extremely limited. Even narrower limits than that existed. Some families produced on the farm the food, the clothing, the boots and

shoes, the farming tools and implements. In fact, nearly everything that was consumed or used by the family was produced by the family.

Now all is changed. Most of the things consumed are things which somebody else produced, and most of the things which the inhabitants of the town produce somebody else consumes. That means specialization and exchange. Why has the change taken place? Simply because everybody wants to make the best living he can, and to make it with the least effort.

It is an illustration of the working of the law of the survival of the fittest. The old method adopted by the jack of all trades could not compete successfully with the method of specialization, and consequently was forced out of existence.

Next we will consider the subject of the allotment of specialties. To whom are to be assigned the different kinds of work? Who is to be the mechanic? Who, the tailor? The doctor? The merchant? And so on. What we want is the general principle involved. The problem would be stated comprehensively as follows: By whom and where should the work of the world be done?

The opinion is frequently expressed that each kind of work should be done by those who can do it best. A little reflection, however, will convince one that such a theory is not correct. Many of us employ men to do work that with a little practice we could do better. One writer illustrates this principle by saying that without doubt there are many United States Senators who could, with a very little experience, wash the floor of the Senate chamber better than the scrub woman who does that work. Sometimes we are almost inclined to the belief that it would not be a national loss if the two exchanged places.

But a new illustration will not aid in solving the problem, so we will refer to our original illustration. If we consult our two fishermen, A will inform us that he finds it profitable to employ B to do work that he could do in half the time required by B, but he can catch fish four times as fast as B, and so adopts fishing as his specialty; and B tells us that he can get nine fish an hour by baiting hooks for A, while he could only get six an hour, working at both baiting hooks and fishing, so he adopts baiting hooks as his specialty. So from the testimony of A and B we learn the correct theory of the al-

lotment of specialties, which would be expressed as follows: The best living is made for all when each is engaged in that employment in which he has the greatest productive capacity. And the same principle will apply to the localization of industries and the employment of capital; and we would say the best living is made for all when each employs his capital, and the land which he uses productively, in that industry which will bring the best economic return. These principles we assert to be axiomatic and capable of universal application.

Now assuming that we have demonstrated the correctness of the theory that the best living is made for all when the labor and capital of each are devoted to that specialty which will bring the greatest economic return, there remains to be solved two other problems of equal importance: first, to what particular specialty is each individual and each portion of capital best adapted; and second, who is to be the judge of the fitness and to make the selection?

To know that the first problem is difficult to solve correctly we have only to look about us and note the professional and industrial misfits. There is the minister, for instance, who ought to have been a plumber; and the lawyer

who could change places with the prisoner at the bar with benefit to society, particularly if the verdict is to be guilty, and the sentence imprisonment; and so on through our whole professional and industrial systems. The failures already referred to furnish multitudinous examples where devotion to the wrong specialty results in loss to the individual and society.

Now when we consider what must be the correct answer to the question of who is to make the selection, we can understand that there can be no efficacious remedy for the misfit evil, for it results from a want of willingness, intelligence, or business sagacity on the part of the one who alone has the right to make the final selection.

In answering the question of who should be allowed to decide to what particular specialty or industry the labor or capital of any individual should be devoted, we are guided by well-established principles. Hence we find it much easier to determine what is legally and morally right than what is economically profitable. The constitution and laws of the United States vouchsafe to each citizen the right to equal freedom, hence each has the right to decide for himself in what particular industry he is to

engage either his labor or his capital, with, to himself, most satisfactory results, — providing always that he carries on his activities within that circumscribed limit which equal freedom imposes. Any state or national law, any custom, organization, or institution that interferes with this principle of equal freedom is tyrannical and injurious, and prevents society as a whole from making the best living possible.

We are now prepared to announce the general truths and practical working principles of our thesis. In that highly evolved and complex industrial society in which we live, everybody as a general rule who is making a living is working for somebody else. We supply our wants by supplying the wants of others. Therefore, the better living we make, the more we help others make their living; and the better living others make, the more they help us make ours. Hence the reason why we can make a better living, and make it easier when living among intelligent, thrifty, and moral people inhabiting a country with extensive and multifarious resources, than we could living among barbarians inhabiting a desert. And these principles apply to groups, to states, and to nations, the same as to individuals.

So the two humble fishermen selected for our illustration have the honor of furnishing all the facts and theories necessary to solve the most complex interstate and international economic problems, for when analyzed we find that interstate and international commerce is nothing more than exchange of services or commodities among individuals. When we recognize the fact that we help ourselves most when we help others most, either as individuals or nations, we realize that the most beneficial egoism or patriotism is that which harmonizes most perfectly with altruism, and the Golden Rule, "Do unto others as you would that others should do unto you," becomes a scientifically correct economic principle.

SOCIALISM: ITS STRENGTH AND WEAKNESS

A Review of Karl Marx's Philosophy

1915

Though much has been said and written about Socialism in times past, there still remains, even in the minds of those who are familiar with its literature and the theories of its advocates, considerable doubt and perplexity concerning the exact meaning of the name "Socialism." But much as its advocates differ in respect to the theories they advance and the methods of putting them in operation, of two things we may be certain: first, that Socialism stands for an industrial organization of society radically opposed to, and differing from, the organization now prevailing; and second, that the establishment of the new organization will, all Socialists believe, greatly benefit the toilers of the world, — those that have to endure the hardships, the dangers, and the sufferings of the working classes which constitute the great majority of humanity.

Now while it is true that the propaganda of

Socialism has frequently, if not generally, been accompanied by violent language, social disorder, and revolutionary outbreaks, leading sometimes to bloodshed, we should still examine and discuss its theories with that open mind which characterizes the seeker after truth. "Prove all things; hold fast that which is good," for surely if Socialism can make any substantial and permanent contribution to the great cause of the uplift of humanity, it has the strongest claims on our candid consideration.

We should also keep constantly in mind the historical fact that established ideas and institutions are never wholly right, for society and social institutions are yet in process of evolution. And furthermore, Socialism should not be condemned because it would place certain restrictions upon the ownership and control of wealth or capital; for at all periods of history the state has assumed the right to interpose in the arrangements of property, sometimes in favor of the poor as illustrated by the poor laws of this and other countries, and again in favor of the rich, as illustrated by our high protective tariff laws, and in other ways. Furthermore, at all periods of history there have been social-

istic demands for the redistribution of property, causing riots and other social disturbances, "for the poor we always have with us"; and the misery and discontent, always manifest, prompt the noble and sympathetic to suggest schemes for a more equal, and, as they claim, more just distribution of the products of labor and capital. So that proposals for the reorganization of society on a socialistic plan are not new.

Neither should we condemn Socialism because it has not yet furnished a well-defined and permanent theory which socialists generally could accept.

For when we consider that Socialism is simply a theory relating principally to the production and distribution of the things necessary for the sustentation of humanity, we see that the theories must change, just as industrial methods and conditions have changed. So that Socialism during its evolution, particularly in modern times, has passed through certain formative stages made necessary by the rapid industrial progress. And yet even as late as the middle of the nineteenth century, Socialism retained many of its Utopian characteristics. Many theories have been presented relative to

the rights of the many as opposed to the position and possessions of the few, — ideas of a society in which all should be equal, not only in political status, but in social and economic circumstances as well; and pictures have been presented of societies in which all were workers on equal terms, and groups of fraternal citizens, separated no longer by the egoisms of the private family and home, dwelt together in palaces called phalansteries, which, as one writer says, appear to have been imaginary anticipations of the Waldorf-Astoria Hotel. Here they were to live in luxury, feasting at common tables, and between meals the men were to work in the fields, singing, while the women accompanied their voices on a grand piano under a hedge. Such pictures could produce little effect on the masses, for the people felt instinctively that they were too good to be true.

Socialism in those stages was a dream and not a science, and the world was rapidly coming to believe that science was supreme; and unless Socialism could be shown to rest on a scientific basis, it could not be true.

Consequently, what was needed was for some one, who had the genius, to take the

thoughts, the feelings, the hopes and aspirations pertaining to Socialism, classify and organize them, and deduce from them a definite and comprehensive theory or scientific formula that could be universally applied. If such a thing could be accomplished and the formula could be shown to be rigidly scientific, then it would furnish the nucleus around which a distinctive and coherent party could be formed. About sixty years ago such a feat was accomplished; and the man who accomplished it was Karl Marx, when he published his celebrated treatise on economics, entitled "Capital." Since then Karl Marx's "Capital" has been adopted in all Europe and America as the Magna Charta or the Bible of scientific Socialism.

Now while there have been many changes in socialistic theories since the publication of "Capital," yet it is true that the Socialism that is the vital and practical actuating force among the masses to-day is the Socialism of Karl Marx. Therefore, it is to the theories of Marx that we propose first to give our attention.

In reviewing the manner in which the author of "Capital" developed and defended his theories, we only have time to consider the

fundamental principles involved. The argument as a whole, although ingenious, and in some respects instructive, is extremely elaborate, and contains a vast amount of detail and mathematical formulæ that tend to confuse rather than to convince the reader. His theory of value he evidently borrowed from the early economists, — a theory which has long since been discarded, but which he maintained as the cornerstone of his socialistic structure to the last.

On the other hand, Marx was one of the first to call attention to a fact which the orthodox economists had evidently overlooked; namely, that the capitalistic method of production in its then present form was of quite recent origin, having displaced in its evolution the feudal system, and having developed its distinctive characteristics during the middle or last of the eighteenth century.

The causes of the rapid introduction of capitalism at that time, Marx pointed out, were the invention of the steam engine as a motive power, and the invention of the spinning jenney, the power loom, and other machines and processes which together revolutionized the methods of production generally. Hand labor

and production on a small scale gave place to production by machinery, or the factory system. In England the independent weavers, for instance, who had been supporting themselves by selling the products of their own labor, could not compete with the factories, and so were forced to abandon their looms and seek employment at wages in the factory. Thus they supported themselves by the wages paid for their labor, and not by the sale of their products while working with their own tools and implements. Those that had formerly been their own masters were forced to pass under the sway of a new class known as capitalists, and to use the tools and implements which they supplied. That, Marx pointed out, was the beginning of the capitalistic method of production.

We now know it to be an historical fact that when once established, as it was at first in England, the factory system of production spread rapidly all over the civilized world. Capitalism, so called, rose and spread because it was a practical working system, multiplying and improving the material appliances of life far beyond the reach of the older system which it displaced. Results, which previously mankind had hardly dreamed of, were realized.

This capitalistic system of production Karl Marx sets out to displace, and to substitute for it a system of Socialism which he assumes will bring about a more just distribution of the products of the industries. So he begins his thesis by an attempt to establish a principle of justice, in accordance with which the products of the industries should be distributed. To establish that he first analyzes a commodity.

According to Marx, anything may be classed as a commodity which has these two characteristics: First, it must be something useful; and, second, it must have exchange value. Anything is useful that satisfies a human want of any kind. The nature of such want, or whether it springs from a physical necessity, or from fancy, makes no difference. But no matter how useful a thing may be, or how necessary it may be to the maintenance of life, as for instance the air we breathe, it cannot be classed as a commodity unless it has exchange value. Nothing has value which can be obtained in unlimited or satisfactory quantities without human effort. Therefore, only those things have exchange value which are made useful by the expenditure of human effort or labor. Therefore, the quantity of labor expended in its pro-

duction, measured by standards of time, as hours, days, or weeks, determines the magnitude of the value of a commodity. That, briefly, is the theory of value adopted by Marx, and which he evidently borrowed from Ricardo. But, unlike the early economists, he carries the theory to its logical conclusion in the following manner.

If the value of a commodity is determined solely by the amount of labor embodied or materialized in it, then labor is the only cause or source of value or wealth. Hence, the laborer being a free man, owning his own ability to labor, the total value of the products of his labor is justly his.

This premise and conclusion is summed up in the following brief and comprehensive formula, namely: "*All wealth is produced by labor, therefore, to the laborers all wealth is due.*" That is the scientific formula presented by Marx as the outcome of his elaborate system of economics.

At first thought it might be regarded as a pious generality that, if universally accepted, would not be harmful; but when carefully considered, it is discovered that as an instrument of agitation its potency is mighty. In some

form it is present in every socialist manifesto and every propagandist oration uttered at the street corners. When Ettor was addressing the strikers at Lawrence he told them that the cotton and woolen mills of that place, and all that they contained, belonged, not to the capitalists or stockholders, but to the laborers that produced them. He affirmed that the capitalist contributed nothing to production, and therefore was not entitled to a share of the products of the industries.

As a contribution to the science of economics such a proposition will not prove valuable, but as a trouble-maker it is very efficient. It appeals at once to two instincts that have the greatest influence on conduct, namely: the instinct of cupidity, and the instinct of justice. Humanity will struggle to gratify merely selfish desires, but when the thing which we are striving for is something that we believe rightly belongs to us, and which has been taken or withheld from us by unjust practices, then the struggle reaches the climax of intensity.

So the strength of Socialism among the masses is dependent upon the belief that it is founded upon the principles of justice. But if the principles of justice, as announced by

Marx, cannot be maintained, but are found lacking some of the most important characteristics of real justice, then they furnish an insecure foundation for the system of Socialism which he attempted to establish.

Let us follow the analysis a step further, and see how Marx accounts for the rise of capital and the capitalist. Having settled, as it seemed to him, beyond dispute, that manual labor, estimated in terms of time, is the only source and measure of economic value or wealth, Marx goes on to show that by the use of machinery and improved methods of production, labor in modern times has been growing more and more productive, so that the commodities that formerly required the labor of an entire day for their production, now require the labor of only one half or one quarter of a day.

Thus, a man a couple of centuries ago could only keep himself and those dependent upon him alive by laborious effort through the whole of a long day, while now a man can accomplish the same result with less strenuous effort, working only half a day. That half-day's labor which is necessary to keep the laborer alive and to support a family, so that he will be reproduced when worn out, Marx calls necessary labor.

But since the laborer is capable of exerting his labor power the balance of the day, the latter half he calls surplus labor. The value of those commodities produced by surplus labor he calls surplus value. By surplus value he therefore means all that output of wealth beyond what is actually necessary to keep the laborers alive. "What," he asks, "becomes of this surplus? Does it go to the laborers who produced it?" "No," he replies. "On the contrary, as fast as it is produced it is abstracted from the laborer and appropriated by the capitalist."

Modern capital, according to Marx, means those vast aggregates of machinery, tools, and other appliances, by the use of which the older methods of hand production have been displaced. Here Marx allows the capitalist to interpose with the objection that the increased output of commodities by the new methods is due, not to labor, but to machinery. Therefore, the laborer, as such, has no just claim on such increase. But Marx is ready with the answer that the machinery is nothing but past labor materialized, and used by present labor merely to assist in production. For every cylinder, connecting rod, and crank of an engine, for instance, and each part of every other machine,

owes its shape and fitness for performing its function, to labor, and to labor only. Therefore, only labor (and as he understands it, the labor of the average multitude) remains the sole agent in the production of wealth.

But capital, he says, has this peculiarity. Being labor in an externalized or materialized form, it is capable of being detached from the laborer, and appropriated by other people. And modern capitalism is simply the appropriation of the implements of production by a minority who are not producers, but whose function is acquisition only.

Thus society has been divided into two classes, — one very small group, and another enormously large one; those composing the small group are the capitalistic employers, who, holding the keys of life and death, as it were, are able to impose any terms they please on the multitude whom they employ, as the laborer is obliged to accept the terms of the capitalist, or starve.

Thus all capital, interest, and profits are thefts from the laboring class, of commodities which the laborers alone produced and justly own.

While at the time of the writing of "Capital"

there still remained what Marx termed "a restricted remnant of independent producers using their own tools and implements," this remnant, he claimed, was rapidly diminishing, was being swallowed up by the capitalists. And lastly, just as in England the early capitalistic method of production displaced the small independent weavers and other producers, so in the near future the greater capitalist will swallow up the smaller, the rich will become richer, and the poor poorer, and the middle class will finally be crushed out and disappear altogether.

Thus he predicted that before the end of the nineteenth century there would be nothing left but a few idle and preposterous multimillionaires on the one hand, and on the other, a mass of miserable ragamuffins who created all the millions, but who could retain for themselves only enough food, clothing, and shelter to keep their muscles moving, and protect their nakedness from the frost. Then the death knell of the capitalistic system will have sounded. The producers will assert themselves under the pressure of an irresistible impulse, and will repossess themselves of all the wealth and capital of which they have been unjustly robbed. Then,

since they will own and control all the implements, and furnish all the labor required for production, the wealth of the world will forever afterwards be theirs.

Thus Marx predicted that the system of Socialism which he advocated would be introduced, not by a process of evolution, but by revolution. Socialism would be established, not by a gradual, natural, and comparatively peaceful growth, displacing the older system of Capitalism because it was better suited to the nature and environment of humanity; starting, as did Capitalism, in some locality, and by its inherent economic and ethical force extend its dominion throughout the civilized world. Instead, the revolution would be initiated by a tremendous cataclysm, that would sweep away the very foundations of the social and economic structures of mankind, and revolutionize our ideas and customs of individual property ownership.

Fortunately, history does not record the events which Marx predicted, although the nineteenth century has passed, and the theories which he advanced have for the most part been disproved by the logic of events. But unfortunately, however, there still remains in the

mind of the proletariat the belief that in the main his theories pertaining to the distribution of the products of the industries were correct, and that in the practical working of the wage or capitalistic system of production great injustice prevails.

So it is incumbent on us to be able to show wherein his theories do not harmonize with the facts. If we review his analysis of a commodity, we find his definition unobjectionable. A commodity, Marx says, is anything that is useful, and that has exchange value. Also his statement that a thing cannot have exchange value, which can be obtained without effort, or gratis, is unquestionably true. But that the magnitude of the value of a commodity is determined by the quantity of labor expended in its production, measured by standards of time, we deny.

In reaching that conclusion Marx ignores two important facts, which, expressed in familiar epigrams, are these: First, possession is nine points of law; and second, it takes two to make a bargain.

If A is in possession of a commodity which he has produced by his own labor, or has obtained by any legitimate means, and B wants

it, A will not sell it for exactly what it cost, so long as he thinks that B or somebody else will pay more. And B will not pay even what the commodity cost, if he believes he can buy that, or a similar commodity, for less. So here we have illustrated the principle of supply and demand; and when an exchange takes place, the value of the commodity is determined.

The value of a commodity, therefore, is what it exchanges for, and value and cost of production run parallel only with those commodities which can be produced in practically unlimited quantities, and where competition is unrestricted.

If A and B expend the same time in producing two different commodities, it does not follow that they have the same value, for A may be a genius and B a dolt, and the value of what they produce in the same time may bear the relation of 1000 to 1. Without doubt, Edison has produced in one day by the exercise of his inventive genius, that which is of more value to the world than the average unskilled laborer can produce in a lifetime; and Edison is as justly entitled to the value of what he produces in a day by the exercise of his inventive ability, though it amounts to thou-

sands of dollars, as is the Italian to the wage which he receives for a day's work, using the pick and shovel.

In order to demonstrate the truth of our statement, we must show what justice is, and what is its origin. During our quite recent political campaigns we frequently heard the expression, "social justice." As a method of expressing thought, that is equivalent to saying, "a round circle" or "an empty vacuum." For just as a plain figure cannot be a circle unless it is round, and as the emptiness of space is the only distinguishing characteristic of a vacuum, so justice has reference always to the adjustments of the relations which individuals bear to each other when living in the social state. Hence, without society there could be no idea of justice. And that sentiment or idea which we call justice, is that which fits mankind for the social state, and has been progressively developed and adjusted to the requirements of an ever increasing complexity of social relations.

So the idea of justice at any particular period of industrial evolution is first the idea of the right to individual freedom, or more specifically to the idea of the limits that must be

placed upon the activities of each member of society, in order that all may enjoy equal freedom. The most modern or highly developed idea of justice, therefore, would sanction no special privileges nor any extension of the activities of one beyond the limit which equal freedom imposes. And mankind is so constituted that no freedom can by any possibility be permanent but equal freedom; we do not except even "the new freedom."

But the principle of equality in justice relates only to the boundaries placed upon our activities; for while acting within such equal boundaries, justice would allow that inequality in results that a diversity of productive capacity would bring. So the Socialist is right in saying that the laborer is entitled to the total value that his labor produces. But in trying to determine what would be a just division of the products of an industry, the difficult problem to solve is this:

What proportion of the products of an industry is due to the manual labor of the employees; and what proportion to the inventiveness, the intelligent directive ability, and the capital of the employer?

To solve that problem from the standpoint

of the Socialist who denies the right of individual ownership of capital, is practically impossible, for the unknown quantity becomes so highly involved that it cannot be eliminated. But by the capitalistic method, the problem is automatically solved, and it is easy to understand what justice would allow.

Let us take a concrete example.

A and B are engaged in producing a certain commodity by the use of similar tools and methods, the quantity which they each produce being at first the same. Then each would have an equal right to what he produced. But A finally discovers a process, or invents tools, by the use of which the amount which he can produce is increased tenfold. Assuming that the adoption of the new method in no way interferes with the equal freedom of others, A would be as justly entitled to all that he produces by the new method, as by the old. Then A discovers that he can afford to employ B and teach him to use his tools or processes, and allow him, as a wage, more than B can produce by the old method, and still A can make a margin of profit for himself. And B, seeing that he can increase his income by working for A, accepts the proposal, and a mutual agreement

is reached. Now when, as agreed upon, B performs the labor and A pays the wages, the ends of justice have been met, and the value of the product of the industry that is left after B's wages are paid, justly belongs to A, as a result of his inventive genius and directive capabilities.

The above simple illustration is an epitome of the beginning of Capitalism. So Marx, with his unpaid-labor theory as the source of capital, is false, both to the principles of social economics and to the plainest and most important facts of industrial history. He failed utterly to see that the introduction of a great economic era — an era which brought greater industrial progress in fifty years than had been realized in the previous five thousand—was due principally to two causes. First, to the successful establishment of the principle of individual freedom as opposed to the tyranny of the old feudal order which Capitalism displaced; and second, to the energy, inventiveness, and directive capability of the early capitalists.

Instead, therefore, of living and growing rich on unpaid labor, as Marx claimed, the capitalist had a great social and industrial function to perform, which, as a factor in determining

the exceptional industrial progress of the eighteenth and nineteenth centuries, was infinitely more important than the function of the ordinary laborer. The work of initiating and directing the new industrial enterprises constitutes a function that is not comprehended under the narrow definition of labor, but nevertheless is absolutely essential to progress.

But in justice to Marx, we must admit that his prediction that "the rich would become richer, and the poor poorer," has been partly realized. The rich have become richer. The new methods of machine and factory production make possible the establishment of industries on an enormously large scale, and the captains of those industries that make them successful by their inventive genius, their exceptional business sagacity and foresight, and their wonderful directive ability, become, like Andrew Carnegie, enormously rich.

But the poor have not become poorer. The theory known as the iron law of wages which Marx upheld, — the theory that wages could not possibly rise, but constantly tended to fall to a minimum, barely sufficient to keep the laborers alive, — has been disproved by the facts of industrial history. Wages in those countries

where Capitalism is least restricted have more than doubled since Marx began his work as a Socialist.

So the wealth of the multimillionaire and the poverty of the masses are not reciprocal. Wealth, as a general rule, is the result of business success; and business success, whether agricultural, manufacturing, or commercial, depends upon the market for the commodity. Great wealth, therefore, presupposes a great business; a great business, a great market; and a great market can only be found in a populous community, where the people are intelligent, energetic, and thrifty, and have an income that enables them to adopt a high standard of living.

In proof of the above assertion we cite the fact that with the nation where the accumulation of wealth is most rapid, and millionaires most numerous, there is found the highest rate of wages, and a wage-earning population that are better fed, better clothed, and better housed, and enjoy more of the pleasures and luxuries of life than can be found anywhere else on earth.

A critical examination of the writings, not only of Marx and his contemporaries, but the

works of Socialists of the present time as well, discloses some very astonishing facts. Although their writings show great intellectual ability and a wide range of personal observation and experience, yet such writers seem totally oblivious to some of the most important industrial truths which are really self-evident, or they fail to draw from them the most obvious inferences.

One of the truths here referred to is this. Every great step in industrial progress which has brought to the masses of humanity better economic conditions and a higher standard of living, has always resulted from an increase in production, or in other words, an increase in the amount, or a cheapening of the cost with reference to labor expended, of those commodities that supply our wants and minister to our health and happiness.

Modern industrial society is so constituted that production cannot continue without a demand for the products of the industries. So that, as a general rule, all that is produced is consumed. Hence, for society as a whole to have more to consume, there must be more produced.

I have never yet found, either in the writings

of Socialists, in the platforms of Socialist political parties, or in the rules or regulations of labor organizations, any method proposed for increasing the output.

On the contrary, the demand is always for a larger proportional part of what is produced. The proportion varies from that of Marx and other revolutionary Socialists who deny the right of the capitalist to any part of the products of industry, down to the labor unions that are always clamoring for higher wages and shorter hours. And the methods which they adopt to secure such results, as, for instance, strikes, the boycott, and attempts to enforce the closed shop, simply trig the wheels of industrial progress, and postpone the adoption of those labor-saving methods of production which alone can bring the desired result.

As already stated, the present theories of Socialism differ somewhat from those of the past. The most advanced Socialism recognizes the importance of directive ability. But instead of allowing the captains of industries to reach the desirable positions which they occupy by that automatic process which Capitalism furnishes, where competition determines the survival of the fittest, under Socialism the captains

would be government officials chosen or appointed by political methods such as are now in vogue. There is still present, however, in Modern Socialism the same destructive criticism of the existing economic organization that characterized the Socialism of Marx.

Competition in productive industries is to be eliminated by a denial of the right of individual ownership of land or capital, — the ownership of the same to be transferred to the state. That method of preventing competition reminds one of the story of the hotel proprietor who was annoyed by his guests taking fruit from the table, and eating it in their rooms, causing unnecessary litter. To terminate the annoyance, the landlord posted the following notice:

"To prevent fruit from being taken from the table, there will be no fruit."

By the industrial method that Socialism would establish, private property would be confined to those commodities actually used for consumption by individuals.

Now, may we ask, by what principle of justice would an individual be allowed to own corn to make into bread, while being denied the

right to save any of it to use for seed corn? And would the transference of the ownership of capital from the individual to the government and its management, from the private owner to an elected or appointed government official, eliminate competition? Would it not, on the contrary, simply substitute for business competition, political competition? And would the latter be any more desirable than the former?

When, may we ask, has the competition of two of our great captains of industry presented a more disgusting spectacle than that of two of our most distinguished citizens competing for the highest official position within the gift of the people?

By so-called reformers (or to call them by a more fitting name, by those self-appointed guardians of the public welfare, — and we include the modern advocates of Socialism in that class) competition is held up for wholesale condemnation. With them the most common method of describing it is to call it cutthroat competition. They evidently ignore some of the most important facts pertaining to social evolution. They fail to see that industrial progress, like all progress in the evolution of

organic life, is the result of what Darwin called, "The survival of the fittest in the struggle for existence."

To be sure, the methods of the struggle or competition, if we call it such, have changed. With the lower forms of life, including the lower animals and primitive man, power alone determines success, and might makes right. But a man finally discovered that when he met another man, instead of killing and eating him, he was more valuable alive, as an assistant or slave than for food. So from that beginning there evolved that method of co-operation founded on the principles of justice and honesty, which finally resulted in what we call industrial competition.

Now the survival of the fittest, when the struggle for industrial supremacy is confined within the limits which justice imposes, means the survival of the industry that serves society best, and competition becomes our greatest industrial asset. So that if Socialism can only be established by eliminating industrial competition and by a denial of the right of individual ownership and management of capital, its establishment would bring the greatest calamity the world has ever known.

We would summarize the objections to Socialism as follows:

First: The theories of Socialism rest on fallacious premises, and conflict with the fundamental principles of justice. For under Socialism all industries would be subject to bureaucratic control. Therefore, individual choice of occupation would give place to appointment by officials, which means not the enlargement of individual freedom, but virtual slavery.

Second: Socialism would be objectionable from the standpoint of economic expediency for the following reasons:

A denial of the right of ownership and control of capital, and the elimination of the hope of the reward that comes from the exercise of superior ability, would remove the incentive for initiative in the way of experimental work leading to discoveries and inventions, and progress would be at an end.

The administrative difficulties of Socialism would be practically insurmountable. The probability that the right men would be selected for superintendents of the industries, and that every other person would be assigned the positions to which they are best fitted, would be infinitely more remote, were the

selection made by political instead of by competitive business methods.

Third: Socialists greatly underrate the psychological obstacles to their plans. The average man is neither so inclined to work nor so zealous for the public welfare as to make Socialism possible without compulsion. And when the altruistic sentiments of mankind become so highly developed that Socialism could be adopted without compulsion, then it would make no difference what form of industrial organization is adopted.

But although Socialism is excluded from nearly every field that it would occupy, either from the standpoint of ethics or economic expediency, or on account of man's unfitness for its adoption, there still remains a restricted area which it now occupies, and which is slowly but surely increasing, as population becomes more dense, and individual freedom necessarily more restricted.

When the conditions and circumstances are such that an industry essential to social welfare cannot be established and carried on competitively, or without the granting of special privileges, and a monopoly is unavoidable, there government ownership and management is

justifiable, and the industry may take the socialistic form.

For the granting of special privileges or exclusive public franchises to an individual or a private corporation which give a monopoly of an industry is manifestly unjust. And to place such restrictions upon those industries that practically allow the corporation neither the power to determine the cost of its operating expenses, nor the price it receives for its services, is a method of control that is continually being shown to be inexpedient. Hence, the justification for government ownership and management.

So our analysis leads us to the conclusion that the only legitimate field for Socialism is where an industry is necessarily a state-created monopoly, and government ownership and management the only method by which it can be carried on without a violation of the principles of justice. And the weakness of Socialism is the fact that its universal adoption would place restrictions upon industrial freedom, that are not required to secure equal freedom, — hence, would be both unjust and economically inexpedient.

AERIAL NAVIGATION

1910

As we contemplate the changes that have taken place during the century from which we have recently emerged and compare the effect those changes have produced on our various activities, our industrial and social life, we would unhesitatingly rank as most important those which pertain to our methods of travel and transportation. The modern methods of locomotion have practically changed the geography of the earth, for we now cross the Atlantic Ocean in as many days as it formerly required weeks; and we cross the American continent in as many days as it required months.

Then the close of the nineteenth century witnessed the introduction of the automobile, which during the first decade of this century has developed into an industry of enormous proportions, requiring the investment of billions of capital, and furnishing employment for hundreds of thousands of artisans. This invention has produced a wonderful effect in the mobilizing of society, so that we are rapidly

becoming the most nomadic race that ever inhabited the earth.

But wonderful as the inventions are which brought about those changes in our methods of locomotion, there still remained creations and inventions still more wonderful, radical, and unique for the twentieth century to bring forth in a practical form — the completion of the dynamic flying machine.

Let us see why the flying machine is the most radical and unique of all inventions pertaining to locomotion. Upon reflection we see that in all former changes in methods of travel by land or water, all improvement resulted from the adoption of a new method of propulsion. Man had sailed in boats century upon century before the invention of the steam engine and its application to the steamboat. Centuries before he had even utilized the mechanical energy of the wind for propulsion, he had paddled his own canoe. The oceans had been crossed and recrossed thousands of times before the advent of the steamboat. So, too, we had been riding on the land in vehicles on wheels for centuries before the railroad train or automobile was invented. So the steam engine, internal combustion engine or gasoline engine, and the

electric motor simply furnished a new but vastly superior method of propulsion.

The entire weight of vehicles and load had to be supported on wheels on the land or in boats on the water, and with all our inventions we were still navigating the same element in a similar manner. But with the flying machine we leave the surface of the earth and soar into the air, the motor furnishing the power not only for propulsion but for sustention also, and we thus navigate a new element.

It is my purpose in this paper to give a brief review or synopsis of the development of the modern airship and to give a concise but fairly complete description of the various types, also to explain the static and dynamic principles upon which their success depends. I wish further to predict the possible effect which these new inventions will have upon our methods of travel and transportation.

Before outlining the history of air navigation it is important to state that the ability of man to fly or soar into the air depends upon one of two principles — either the machine and its contents must be lighter than the air which it displaces, and hence called an aerostatic machine or balloon, or it must be driven

through the air at a velocity sufficient to keep it floating, and thus be called a dynamic flying machine.

This problem which man has solved cannot be stated more clearly than by quoting from the familiar and humorous poem by Trowbridge, "Darius Green and his Flying Machine." Darius says, "Birds can fly, and why can't I?"

Now, it is worthy of note that while this problem of man flight is the last to be solved, it has interested mankind since remote antiquity; but the history of the attempts to solve the problem of mechanical flight in a scientific and practical manner does not extend back into the remote past, but what was during the past an indefinite and purposeless idea has, during the last century, taken definite form and activity, and since the advent of what we term the "Machinery Epoch." Since the most marvelous results have been achieved by the application of modern science to the various mechanical arts, the public has awaited with eager expectancy the solution of the problem of aerial navigation.

So far as can be learned from the literature of those times, the ancients regarded aerial

navigation as impossible. Greek fable and mythology merely recognize the conception or idea of man flight as indicated by the fable of "Dædalus and his wings cemented together with wax," but there are no accounts of any real attempts to solve the problem practically.

During the middle ages the field is scarcely more fruitful. There are records of a few attempts at gliding flight, most of which resulted in disaster, but the attention which was given to the subject was principally in the nature of mere speculation. Like Darius Green they said, "Birds can fly, and why can't I?" but so far as we can learn, they contented themselves with a mere statement of the problem and did not, like Darius, risk their lives in attempts at its solution.

The statement of these meager facts brings us to the invention which for the first time wrested the art of aerial navigation from the realms of mere speculation and placed it upon a scientific and practical basis, viz., the invention of the balloon. The germ of this invention must be credited to the English chemist, Henry Cavendish, who in 1776 discovered the remarkable lightness of hydrogen gas. But the real invention was made by the Montgolfier

brothers, who were residents of Paris. Therefore, the balloon must be regarded as a French invention. Upon the announcement of the discovery of the remarkable lightness of hydrogen gas, which was then called inflammable air, many English and French scientists became interested in the peculiar qualities of the gases; but it was not until the year 1782 that the two Montgolfier brothers of Paris constructed a silk balloon containing fifty cubic feet of hot air that ascended to the ceiling of the room in which it was constructed. In 1783, the same brothers constructed a much larger hot-air balloon which in the town of Annonay and in the presence of a large multitude ascended to the height of fifteen hundred feet. They made several public demonstrations during that year, sending up balloons of large proportions, one of which made an ascent at Versailles in the presence of the king and the royal family, and carried the first passengers, — a sheep, a cock, and a duck. These, the first aerial voyagers, were confined in a wicker basket and reached an altitude of about two thousand feet and returned to the surface of the earth in safety. Soon after that, or on November 21, 1783, was made the first aerial voyage by man.

In this ascension two Frenchmen, one of the Montgolfier brothers and another resident of Paris, went up in a hot-air balloon, remained in the air nearly half an hour, and sailed across the city of Paris.

Then on December 1st of the same year, the first scientifically complete balloon made its ascent. The expense of its construction was defrayed with funds raised in Paris by subscription. That balloon was in all respects an up-to-date machine. It was made of silk, varnished, and covered with a network to support the car, inflated with hydrogen gas, provided with a valve at the top for letting out the gas when the navigators wished to descend, and with sand ballast which could be thrown out to lighten the machine when they wished to rise. There was a barometer for ascertaining the altitude and a thermometer for showing the temperature. In fact that balloon, constructed one hundred and twenty-seven years ago, was practically as complete as any that has ever been built since.

It is hardly possible for us at the present time to realize the profound sensation such a wonderful scientific achievement created. Dr. Franklin, who was United States Minister to

the court of France at that time, was an interested spectator of all those first ascensions, and in a series of letters written to Sir Joseph Banks, President of the Royal Society of London, gave a complete and intensely interesting description of them. These letters show the wonderful mind of Dr. Franklin as indicated by his extensive knowledge of science, and the clear appreciation which he had of the future possibilities and importance of the invention. He was not extravagant in forecasting the future and predicted that the balloon would first be made useful in war, for conveying messages into or out of a besieged city and in reconnoitering to discover the position of the enemy. In fact he practically foretold all the uses that have been made of the balloon down to the present time.

The first descent from a balloon in a parachute was made in 1797, or fourteen years after the first ascent by man, and that was one hundred and thirteen years ago. With such a balloon the air could be navigated only vertically. The machine could be made to rise or fall, but was completely at the mercy of the wind, so far as horizontal motion was concerned.

Now, we pass over the interesting history of ballooning with its many wonderful achievements, thrilling adventures, hairbreadth escapes, and unfortunate fatalities, and take up the subject again at the time of the attempts to navigate the air with a balloon equipped with a steering and propelling apparatus for moving and guiding it horizontally. Such is called a dirigible balloon.

Attempts were made in England to propel a balloon through the air with a steam motor as early as 1852; but the first really successful attempt was made in France in 1883 by Tissandier, just one hundred years after the balloon was invented.

Up to that time all balloons were nearly spherical in shape, and therefore presented a large area of surface to the air. To propel them through the air at high speed was not practical on account of the enormous power required to overcome air resistance. But Tissandier made his balloon cylindrical and pointed at both ends, and this greatly reduced the air resistance. Since that experiment all makers of dirigible balloons have adopted that shape. Tissandier's dirigible had the following dimensions: length, ninety-one feet; diameter, twenty-

nine feet; total weight, including passengers, twenty-five hundred pounds. A propeller similar to those used at the present time was driven by an electric motor. The maximum speed in still air was less than eight miles an hour. This creation could not by the most optimistic be regarded as a practical flying machine, as it was completely at the mercy of even a gentle breeze, on account of its low rate of speed. Nevertheless it suggested to the French government the idea of using the dirigible balloon for military purposes, and in 1884 the balloon corps of the French army commenced a series of experiments which were continued for many years, and carried on at great expense, but with no very satisfactory results.

These experiments were accompanied by many others made by private citizens of many nations, the most notable of which were those by Count Zeppelin of Germany, who in 1900 made several successful voyages, one of which covered a circuit of more than twenty miles.

Since that time, or during the first decade of the twentieth century, great improvement has been made in the construction of the dirigible balloon. The size has been increased, the

largest being the one constructed after the plans by Count Zeppelin, which has the following enormous dimensions: length, 446 feet; diameter, 40 feet. It has a capacity for gas of 400,000 cubic feet. The modern high-powered and light-weight gasoline engine is employed for propulsion, and in the Zeppelin balloon the propeller is driven by two engines of 80 horse power each. When equipped with fuel for a trip of 500 miles (and it has covered nearly twice that distance), it has 2200 pounds of gasoline, 600 pounds of lubricating oil, 2200 pounds of water for ballast and cooling, and then has a capacity for only ten passengers. Of course for shorter trips as many as forty passengers could be carried where the greater part of the supplies was dispensed with. This machine is not only the largest but also is the fastest of any of this type, having attained a speed in still air of nearly thirty-five miles an hour. The Zeppelin machine has a rigid aluminum framework covered with linen or silk coated with rubber to make it gas tight.

We can understand that those who are interested in this type of machine might claim that the problem of aerial navigation was solved since uninterrupted voyages of nearly

one thousand miles are made, and a score or more of passengers carried. But when we consider the enormous size of the machine and its limited carrying capacity, its high cost of construction, maintenance, and storage, it can hardly be said to be practical or economical as a means of travel or transportation. Hence, if we expect a practical solution of the problem we must look for some other type of machine. However, this type may be useful to governments in times of war. But if we can only fly with a machine lighter than air we would still have to admit the superiority of the birds, for they are all heavier than air. This brings us to the problem of the heavier-than-air type, or the dynamic flying machine.

Before proceeding to describe the evolution of the dynamic flying machine, we will consider briefly what was at the time of the invention of the dirigible balloon the state of the art. In an article published in the "Century Magazine" in 1891 by Hiram Maxim, the following statements appear. Maxim says:

"In 1889 I decided on conducting a series of experiments in order to ascertain if it were possible to construct a practical flying machine, but before beginning these experiments I took

every means of learning what had already been done by others, purchasing all the books obtainable in the English and French languages. A careful study at that time seemed to point to the following state of the art. The only apparatus which had ever been made to ascend with one or more men on board was the balloon. Many attempts had been made to steer or navigate balloons, but with only partial success. The speed which they were able to make did not enable them to make headway against the lightest kind of breeze. With machines heavier than air no progress had been made. It is true that a great many experiments in the line of heavier-than-air machines had been conducted by others, but always on an exceedingly small scale, and with very imperfect apparatus, and the result most unsatisfactory. I therefore determined to make my experiments on a scale sufficiently large to render them of some value."

We also quote from an article that appeared in the "Popular Science Monthly" at about that time, which will indicate what scientists, particularly the professors in colleges, thought of the possibility of constructing such a machine. Professor Joseph Le Conte, Professor of

Natural History and Geology in the University of California, after giving a very exhaustive analysis of the subject, gives in conclusion what he has shown to be three indisputable facts:

"First: there is a low limit of weight, certainly not more than fifty pounds, beyond which it is impossible for an animal to fly. Nature has reached this limit, and with her utmost efforts has failed to pass. Second: the animal machine is far more effective than any we may hope to make. Therefore, the limit of the weight of a successful flying machine cannot be more than fifty pounds. Third: the weight of any machine constructed for flying, including fuel and engineer, cannot be less than three or four hundred pounds. Hence, it is physically impossible to construct a true flying machine, one which is self-raising, self-sustaining, and self-propelling."

Professor Le Conte informs us in his article that his opinion and the conclusions which he has arrived at are those that are universally shared by educated scientists the world over. So that what we have achieved in the way of aerial navigation must not be credited to our institutions of learning. It has come from the

practical, and for the most part uneducated, mechanics.

The invention of the heavier-than-air flying machine is another illustration of a quite well-known fact, namely, that a great many things are decided to be impossible by our highly educated scientists, and are consequently considered impossible by the public generally, until some man comes along who is so ignorant that he does not know that the thing is impossible, and goes ahead and does it.

Before the first dirigible balloon made a successful trip, much attention had been given to the flight of birds, particularly the larger type of soaring birds, such as the hawk, the eagle, the buzzard, and the condor. It was known that those birds could travel long distances and reach high altitudes without the flapping of wings. There were many who were saying: "Why cannot man imitate them and construct a soaring machine with wings as large in proportion to the total weight carried as those of the bird?"

Otto Lilienthal, a German engineer, was one of the foremost experimenters in that field, his operations extending from 1891 to 1896. He developed the two-plane gliding machine with

which he made his flights, and by taking a running start from the top of a hill would launch himself into the air and glide down the slope, and land out on the plain beyond. He was collecting some very valuable data when he was unfortunately killed by the upsetting of his machine by an unexpected gust of wind.

Next, Pilcher of England took up the same work, and after making some progress, in an accident similar to that of Lilienthal's, was killed — another martyr to the cause of aeronautics.

About that time Octave Chanute of Chicago was experimenting in the same line. He made hundreds of flights without an accident, and did more to develop a type of machine that could be steered and otherwise controlled than all of his predecessors. He developed the glider to such a degree of perfection that entitles it to be called the parent of the aeroplane.

To imitate the birds in the manner of flight would naturally suggest itself to the early experimenters, and many attempts have been made to fly by the use of flapping wings, but, like Darius Green, they could only fly in one direction and that was nearly vertically downward, and generally one attempt satisfied them.

Then, too, many had a theory that a machine could be raised into the air by a propeller working on a vertical shaft, so that it would start from a standstill and rise vertically into the air. Such a machine is called a Helicoptei. All machines of that type up to this time have proven a failure, excepting those that were very small. Therefore, when the aeroplane, or gliding machine, had been brought to such a degree of perfection as that of Chanute's, all other methods of accomplishing flight were practically abandoned and the aeroplane type of flying machine was looked upon as the only possible solution of the problem of human flight with a heavier-than-air machine.

Before proceeding with the history of the evolution of the flying machine, we will consider the principles upon which its success depends, or in other words what man must know and acquire the skill to do to enable him to fly.

First: He must know the proper form of the aeroplane or aerocurve necessary to give the greatest lifting power, and what that lifting power is per square foot of surface at different speeds.

Second: He must know the relation between

the lifting power of the aeroplane and the thrust or power required to force it through the air, or the lifting efficiency of the aeroplane.

Third: He must know the proper form and size of the propeller and the pull or thrust per horse power expended. That is, he must know the efficiency of the air propeller.

Fourth: He must either know how to construct, or where to procure a motor that will weigh not more than ten pounds to the horse power. Fortunately, the last could be found ready made, the motor similar to that used in the automobile, before the first successful machine was constructed.

Fifth and last, but by no means least: He must learn how to handle the aeroplane in the air, so as to be able to keep it right side up and steer it in the direction he wishes to go. In other words, he must learn to fly.

The data and principles in aero-dynamics having been discovered, and that experience with the aeroplane gained which made the aeronaut at home in the air — human flight (that dream of the centuries) was made possible.

The history of that achievement is to us extremely gratifying, because it is distinctly

American. Of all the scientific investigators and practical experimenters of all nations, four Americans — Maxim, Langley, and the two Wright brothers — stand at the head in the value of their discoveries and contributions to the art of human flight with a heavier-than-air machine. In making this statement it must be understood that the work of others, both Americans and those of other nations, is not ignored. In fact it is of very great value and importance. But what we mean is that the four men mentioned have discovered all of the data and gained all the experience necessary for the construction and successful operation of the first really successful man-carrying flying machine of the heavier-than-air type.

It was twenty-one years ago, or in 1889, that Hiram Maxim, a native of Sangerville, Maine, but at that time a resident of England, decided to make some experiments to determine if it were possible to construct a flying machine of the heavier-than-air type, driven by a steam motor, that would be capable of flying and of carrying one or more passengers. As already indicated there were no data of any value obtainable, so Maxim constructed a very elaborate apparatus at great expense for ascertain-

ing the principles of aero-dynamics, which we have already stated; namely, the form and efficiency of the aeroplane, and the form and efficiency of the propeller. He had to build his steam motor from original designs, and succeeded in producing a motor that weighed less than eight pounds to the horse power developed. Maxim was assisted financially by several wealthy Englishmen who furnished $100,000 capital for carrying on the investigation. A machine was finally constructed of enormous proportions, nearly ten times as large as the modern aeroplane, but of substantially the same type. It was constructed in strict conformity to the principles and data that the experiments had shown to be true. The correctness of those principles and the resulting design cannot be better shown than by a comparison of the Maxim machine with one that we know to be successful, namely, the machine of the Wright brothers.

	Maxim	Wright
Aeroplane surface	400 sq. ft.	500 sq. ft.
Weight in pounds	8000	800
Horse power	360	30
Propeller thrust in pounds	2100	240
Speed in miles per hour	38	2

While as shown by this tabulation the Maxim machine weighs ten times as much as the Wright machine, that ratio is not closely followed all through, but the variation is not nearly as great as it would be if we compared the Wright machine with the Farman machine, another of about the same weight.

The Maxim machine, instead of being a biplane, which is the familiar construction at the present time, consisted of five planes arranged one above the other. The machine had all the essential features of the modern aeroplane, such as rudders in front and rear for horizontal and vertical steering. It was also constructed to automatically right itself if tipped or rocked to either side from any cause. For the test which was made it was equipped with wheels running on steel rails, with a rail above another set of wheels to prevent the machine from rising into the air, as he did not intend to attempt free flight at first. But on the first trial, when a speed of a little more than thirty miles per hour had been attained, the machine lifted from the lower track and the wheels pressed against the upper track or rail with such force that the axle was sprung. The wheels that were to prevent it from rising slid from

under the track, the machine rising several feet. The power being shut off after making a flight through the air entirely free from contact with the ground or tracks of several feet, it came down, striking the ground with such force as to be completely wrecked.

Thus Maxim's experiments, like those of Darius Green, ended in disaster, but unlike Darius, Maxim had demonstrated that dynamic flight was possible and had discovered the means to accomplish it, and he gave to the world an immense amount of valuable data. But his principal backers had lost confidence, saying that it was not very encouraging to try to fly when it cost at least ten thousand dollars to light. So they refused to furnish more capital, and the great inventor was obliged to discontinue his work which, if it could have continued, would undoubtedly have proven successful and hastened the advent of the flying machine of that type at least a decade.

Next to Maxim came the late Professor Langley, a native of Roxbury, Massachusetts, and at the time of his experiments Secretary of the Smithsonian Institution at Washington. While he discovered very little that was really new, he gave the data already furnished by

Maxim and others a more scientific character. His greatest achievement in aeronautics was the construction of a small aeroplane of the monoplane type, driven by a one horse-power steam motor (the total weight of the machine and motor being about twenty-seven pounds), that made three flights of some three quarters of a mile each, in 1896. These experiments attracted world-wide attention, and gave Langley confidence to ask Congress for an appropriation of $50,000 for constructing a similar machine of a man-carrying size. The appropriation was granted and the machine was built. When completed, two unsuccessful attempts were made to launch the machine with C. M. Manley aboard, but in both cases the machine made a headlong plunge into the Potomac River as they were launching it from a boat. The last time the machine was so badly wrecked that further attempts were impossible. So Professor Langley was forced to abandon his work, as the appropriation had been exhausted, and he unfortunately had to join the ranks of the Darius Greens and face the ridicule of the public press. One newspaper correspondent who witnessed the trials facetiously remarked that $50,000 might be a fair price

for a flying machine, but Uncle Sam ought to be able to buy a diving machine as good as Langley's for less money. But to do justice to Professor Langley we must add that if he could have continued his work he would certainly have succeeded. His machine was correctly designed, and all the proportions were quite similar to the modern flying machine of the monoplane type, like the one, for instance, that crossed the English Channel.

But both Maxim and Langley were making the same mistake. They were trying to operate a flying machine without knowing how to fly, and no matter how perfect their apparatus, they were sure to fail until they had acquired the manual skill which could only come by experience in the air. They were in much the same condition as the man in Massachusetts who has his first automobile. He cannot run it himself on the public highway until he has a license from the highway commissioners, and he cannot get a license until he can demonstrate to the commissioners that he can run the automobile.

But the art of man flight had reached too nearly the practical state and had engaged the attention of too many clever mechanicians to

be dropped on account of an accident or two in launching. All conditions were ready for successful flight when the man came along who could combine a knowledge of the scientific principles involved, as shown by Maxim, Langley, and others, and the art of handling the aeroplane in actual flight, like Lilienthal and Chanute. The opportunity to make a reputation world-wide, and a name everlasting, now presented itself.

Two modest, unassuming bicycle manufacturers of Dayton, Ohio, improved the opportunity — two brothers, Wilbur and Orville Wright. These men were perfectly familiar with the work of Maxim and Langley, Chanute and others, but they attacked the problem in an original way. Both Maxim and Langley with dynamic machines, and Chanute and others with gliders, had aimed to produce machines that would automatically right themselves if anything should give them a tendency to tip over, and the steering was confined merely to the right and left. But the Wright brothers decided to make the entire control manual, so that they would be as independent of air currents as are the birds. Instead of having the aeroplanes rigid their entire length,

and the outer ends raised to secure lateral stability, they were made flexible, so that the outer ends could be warped or bent up or down by means of a lever, and thus balance any unequal lift or tendency of the machine to tip. To prevent any pitching up or down, and for the purpose of steering vertically, they placed in front two small horizontal planes on a framework mounted so as to turn up or down by means of a lever. The steering to the right and left was accomplished by a vertical rudder at the rear, on the same principle as the rudder of a ship.

When they had completed their gliding machine, they took it down to the sand-hills in the eastern part of North Carolina, and spent the greater part of the first three years of the twentieth century in acquiring the manual skill necessary to fly, or as one writer puts it, to qualify for the degree of bird man. They were then ready for the final step, that is, equipping the aeroplane with a suitable engine for driving a propeller for accomplishing horizontal flight. A twenty horse-power gasoline engine was suitably installed in the aeroplane and arranged to drive two propellers.

When all was completed the total weight of

the machine was about eight hundred pounds. On December 17, 1903, the first trial with this machine was made. It remained in the air only a few seconds on the first trial, but subsequently they succeeded in flying eight hundred and fifty feet.

The dream of the centuries was realized, and the Wright brothers had accomplished what the scientists said was impossible, namely, flight with a heavier-than-air machine, carrying a passenger, without utilizing the lifting power of the balloon. But the machine was not quite as complete as the Wrights desired before making public exhibitions. Consequently they returned to Dayton, Ohio, and continued their work until the fall of 1905. On October 5th of that year they made the wonderful trip of twenty-four miles over a circular course, at a speed of thirty-eight miles an hour. This was an achievement that, without question, placed the Wright brothers on the top round of the ladder of fame, and marks the beginning of an epoch in man's control over the forces of nature.

Therefore we credit the Wright brothers with being the inventors and operators of the first dynamic flying machine. But on account

of the fact that the Wrights had several patents pending, and for other reasons, they carried on their work secretly, and only a few trusted friends were allowed to witness their trials. Hence the accounts of their achievements in the public press were meager, and what little did appear was generally discredited. Darius Green and his successors had previously always failed, therefore the public were not ready to accept the word of the Wrights and a few friends, but demanded a public demonstration before being convinced. But meager and apparently unreliable as were the accounts of their achievements, it awakened a great interest in the flying machine throughout the civilized world.

The daring Brazilian, Santos Dumont, who had been experimenting the dirigible balloons in Paris, and who won a prize by sailing around Eiffel Tower, became interested in the aeroplane, and constructed a machine modeled like a box kite with which in 1906 he made several public exhibitions. The most of his attempts at flight were more like grasshopper jumps than the flight of a bird, but they were still sufficient to greatly interest the French people, because he demonstrated that the thing was

possible and that it was not accompanied with very great danger or expense.

The opportunity that the flying machine offered for a new form of sport awakened the Frenchman to great activity. Blériot, Pelterie, with the monoplane; Farman and De la Grande with the biplane, commenced their work in 1906, and during that year and the year 1907 made some short flights. Several others also entered the field, in France, in England, and the United States.

During this time the Wrights were doing their work in secret. Certainly the public was not taken into their confidence sufficiently to obtain an accurate knowledge of the position they held in the world of aeronautics. But in 1908 they came before the world in their true colors and showed the great progress that had been made with the airship. Orville Wright, in the government tests at Fort Myer, made a public flight of over an hour's duration, and on several occasions carried an extra passenger. Wilbur Wright went to France and, by fulfilling the conditions imposed, sold the French patent rights for their machine for $100,000. During one of the trials he reached an altitude of three hundred and eighty feet, and on the

last day of the year broke all records by a continuous flight of seventy-seven miles, remaining in the air two hours and twenty minutes. So the year closed with the Wrights decidedly ahead of all competitors, and it is not too much to say that they have taught mankind to fly.

But although the Wrights were so decidedly in the lead in 1908, they were fairly eclipsed by others in 1909. However, they did some excellent work during that year, such as a cross-country flight of ten miles with a passenger, at a speed of 42.58 miles per hour, and a continuous flight of an hour and twelve minutes with a passenger, thus complying with the government requirement, and receiving the purchase price for the machine of $30,000.

But the most daring and sensational performance of the year was the flight of Blériot with his monoplane across the English Channel on July 25th. Then later came the great aviation meet at Rheims, France, where so many wonderful flights were made, and where Glenn Curtiss, the clever and intrepid American aviator, secured the most valuable trophy, namely, the International Cup, for the greatest speed over a distance of 12.42 miles at a

rate of 47.4 miles an hour. During that meet three passengers were carried — that is, two beside the operator — and many other interesting things accomplished, among which was the appearance over the aviation field of five aeroplanes all in the air at once; also, the flight of Farman covering a distance of 144 miles at a speed of nearly 40 miles an hour, which is the record for long flight up to the present time. The wonderful things accomplished at the aviation meet in Los Angeles are still fresh in your minds. There Paulhan, in the Farman machine, did the best work, making the record for the highest altitude of four fifths of a mile, and the longest cross-country flight on record. Glenn Curtiss, however, still maintained his position as speed champion, and although he did not equal his speed at Rheims, he beat all competitors, and also won the prize for the quickest starting, making a start in less than seven seconds, and covering only ninety feet before leaving the ground.

But this is detail with which all are familiar, and while very interesting does not add to our knowledge of the science of aviation; so we will pass on to the final problem, namely, the effect which the airship will have upon our

present methods of travel and transportation. In the comparisons which I make, I shall confine myself to those facts and principles which are true now, and which from the nature of the case must always remain true.

There are many attributes and qualities which the perfect system of locomotion must possess, but we mention only the four which are of the greatest importance, and in the order of their importance: First, safety; second, reliability; third, convenience and comfort; fourth, economy. That system is best which possesses these four qualities in the highest degree, and so long as any one is entirely lacking, the system can never be admissible.

We must first understand distinctly the limitations of the two types of machine — that is, the dirigible balloon and the aeroplane — in respect to their possible size and weight-carrying capacity, the possibilities of speed, and the relative safety of the two methods. For the same reason that there is a low limit to the weight of a flying animal, there is a low limit to the weight of a dynamic flying machine.

The following explanation is easily understood. The strength of the flying animal increases in proportion to the area of a cross-

section of the contracting fiber or muscle, or, we may say, as the square of the corresponding parts. But the weight of the animal increases as the area of a cross-section multiplied by its length, or as the cube of the corresponding dimensions. Hence, to double the dimensions of the bird would make it four times as strong, but eight times as heavy. Therefore, since the weight increases as the cube, and the strength only as the square of the corresponding parts, the bird soon reaches the weight limit of the flying animal, and, like the ostrich, becomes a walking animal. The same principle holds true with the aeroplane; that is, the weight increases faster than the carrying capacity, for if the aeroplane surfaces are made longer or wider, the supporting arms and trusses must be made thicker to withstand the extra strain; hence the carrying capacity increases only as the square, while the weight increases more nearly as the cube of the corresponding dimensions. To a certain extent the same principle holds true with the motor. Professor Le Conte, already referred to, was right when he placed the limit of the flying animal at fifty pounds, and he gave the correct explanation of the fact, the explanation which we have

quoted. But he was wrong when he said that the animal could develop more power in proportion to its weight than any machine which man could hope to build.

We use as a dynamic unit or standard what we call the horse power, that is, the average work per minute that a horse weighing 1000 pounds can perform during the day, and it is equivalent to lifting 33,000 pounds one foot per minute, or 33,000 foot pounds. Now, the motor used in a flying machine weighs only from four to eight pounds, per horse power, or is from 125 to 250 times as efficient as the horse; and the total weight of the flying machine, with all of the accessories and passengers, is still less than fifty pounds to the horse power, or twenty times as efficient, as a power-developing machine, as the horse. So the dynamic flying machine, large enough to carry passengers, is made possible only because the modern engine is much more efficient than the animal as a generator of power. But as already shown, the weight limit of this type of machine is very low.

Now, with the dirigible balloon the opposite is true; that is, the carrying capacity increases faster than its weight; for since the pressure of

the gas in the balloon is exactly balanced by the pressure of the air outside, there is no strain on the containing envelope, and the weight varies nearly as the surface varies, but its carrying capacity varies as its volume, or as its surface multiplied by its third dimension, so its weight increases nearly as the square, while its capacity increases as the cube of its corresponding dimensions. Therefore, it can be made of enormous proportions, and capable of carrying many times as much weight as the aeroplane. Again, since the distance which a flying machine can travel without stopping depends upon its fuel supply, the dirigible balloon will be capable of longer trips than the aeroplane, because it can carry more weight of fuel. The record for the longest flight in an aeroplane is 144 miles; for the dirigible balloon 900 miles. But there is a movement on foot in Germany at the present time to construct a dirigible balloon of sufficient size to travel 3000 or 4000 miles without landing, in which case it could cross the Atlantic Ocean. Of course a machine of that size, in making short trips, could carry hundreds of passengers.

But the speed of any machine — as a boat through the water, a railroad train, an automo-

bile, or a flying machine — depends upon the relation between the resistance and the driving power. Hence, to double the power would double the speed, if resistance remained the same; but resistance never remains the same. With a motor boat or a flying machine the resistance is due entirely to the displacing of the medium in which the machine is moving, and the resistance through that medium varies as the square of the speed. So that to double the speed would mean that the resistance is multiplied by four, and if the resistance was four times as great, and the machine traveled twice as far in a given time, the power required would be multiplied by eight; or, to state it briefly, the power required to propel a boat in the water, or an airship through the air, varies as the cube of the speed. Hence the reason why it is so very difficult to increase the speed of a steamboat, and why the airship may never acquire a high rate of speed.

Up to the present time the aeroplane has attained greater speed than the dirigible balloon, and it would at first seem that on account of the relatively small surface presented to the air, it would continue to hold the record for speed; but no one can predict what the result

may be when a dirigible balloon is built as small in diameter and as long as possible, so as to encounter the least air resistance in proportion to its carrying capacity and power. But for speed, both types of airship are at present far below the railroad train and the automobile. No airship has ever reached a speed of sixty miles an hour, while the automobile has made more than twice that rate.

When we realize that the resistance to the rapid motion of the flying machine is air resistance, and that the power required to propel it varies as the cube of the speed, and that the carrying capacity is so narrowly limited, it can easily be understood that such a machine can probably never compete with the vehicle on wheels.

As to safety, the balloon type of airship can certainly claim superiority, for it can still float in the air without the use of its motor, so that if the motor should stop from any cause, a landing would not have to be made immediately, but it could drift with the air current until a suitable place for landing was reached, like any other balloon. But since the aeroplane derives its power of sustention entirely from its speed, it is much more difficult to start and

terminate the flight, and must have an open field in which to land. Therefore, during the flight if the motor should fail from any cause, a landing must be made at once, as the machine must glide down a steep incline which in most cases would be extremely hazardous, as open fields without buildings, trees, or other obstructions are not always near. But when we compare the airship of any type, with respect to safety, to our present methods of transportation, we at once conclude that it is and must always remain vastly inferior.

As to reliability, since the airship is traveling in a medium that is itself moving, sometimes in one direction and sometimes in another, and at rates of speed varying from a little above zero to a velocity much greater than any flying machine can attain, and sometimes in gusts so that an attempt to fly would mean sure destruction, the airship can never be a reliable method of locomotion. But if safety and reliability could be provided, the large area of open country necessary for a starting and landing station would make it a very inconvenient method of travel.

And lastly, as to economy, it is not now and never will be possible to transport a given

weight of load over a given distance as cheaply, supported only on the air, as it can be moved on wheels either running over the road or on the steel rail. So that the airship can never hope to compete with our present methods of transportation in point of economy.

The following comparison will give a definite idea of the relative economy of the flying machine and the railroad train in transportation. A flying machine, weighing 800 pounds, capable of going 40 miles an hour, would have 30 horse-power motor, or $26\frac{2}{3}$ pounds to the horse power. A railroad train having a total weight of 2000 tons has a 1000 horse-power motor, or 4000 pounds to the horse power, a ratio of about 1 to 150, in favor of the railroad. But suppose the flying machine could reach an efficiency of 50 pounds to the horse power, which is possible with a small machine, the relation would still remain as 1 to 80 in favor of the railroad.

From the facts given, we draw the conclusion that for safety, reliability, convenience, and economy, the flying machine fails to qualify as a first-class method of transportation, and in that field will probably never be able to compete, either with the railroad train, the

steamboat, or vehicles running over the public highway.

But while the facts which I have stated I consider incontrovertible, and the conclusions which I draw correct, still the future will probably reveal great possibilities of usefulness for the flying machine, not in doing the grosser kinds of transportation, for that is as absurd as it would be to transport coal with courier pigeons, but in performing functions that at present we know little of, but which may be so important that the flying machine of the future may be regarded as the greatest invention of modern times pertaining to locomotion.

THE END